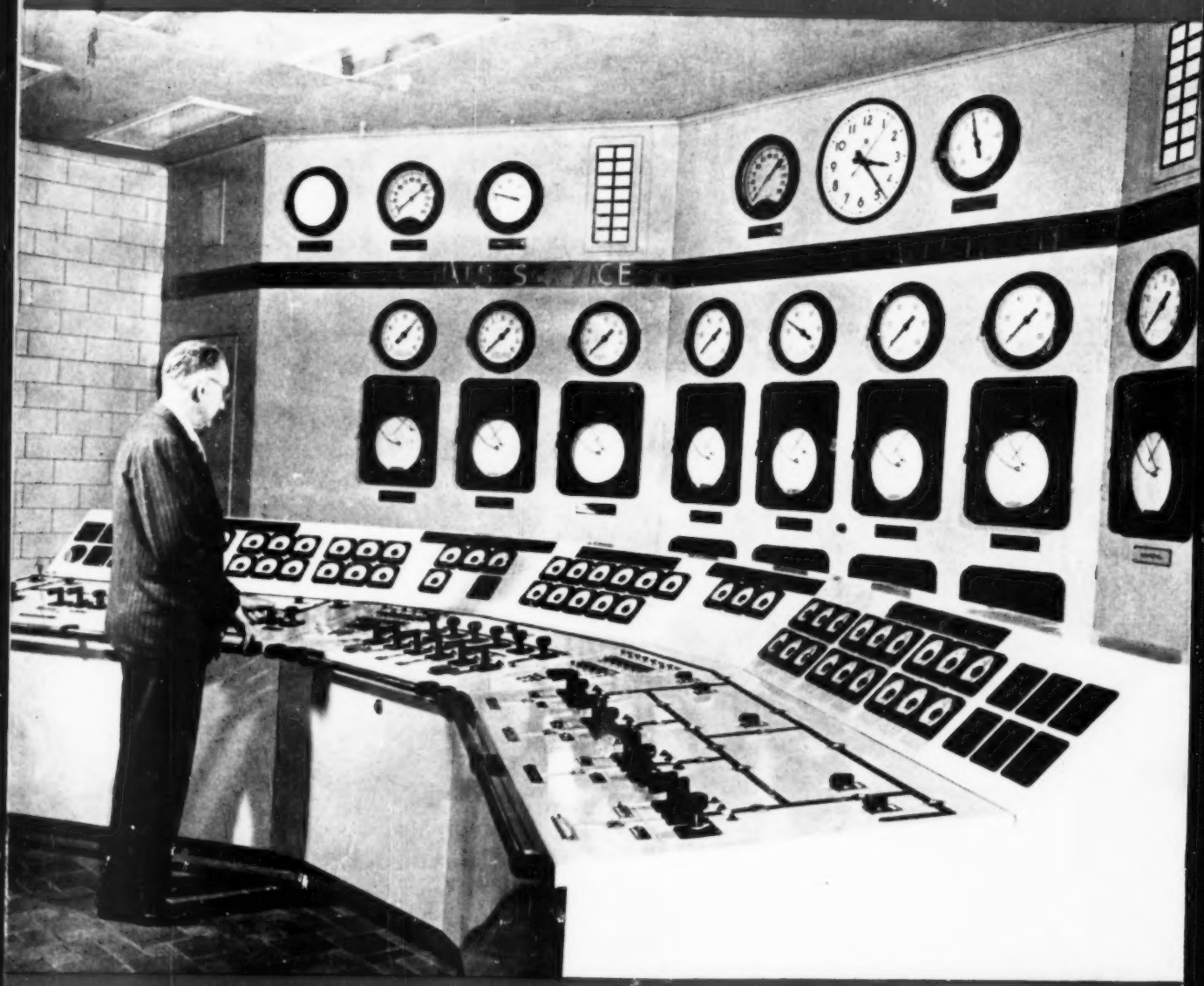
SECTION I*

# WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL

*Section 2 is 1952 Index



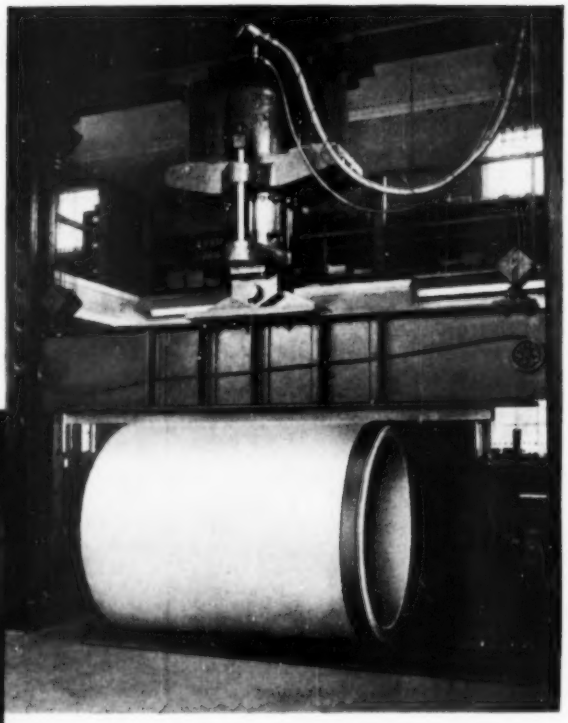
JANUARY, 1953

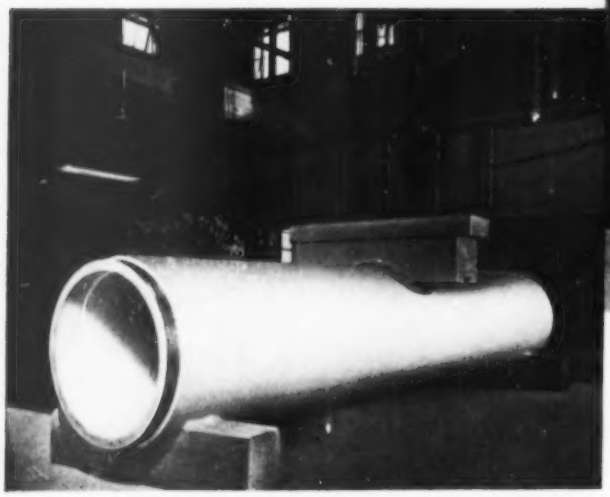
New Central Control Sta. Cincinnati Water Works . . .

Remote control of pumps and valves through this telemetered G.E. indicating switchboard—(see "Water Supply Developments—1952")

*test after test assures the best*

# IN LOCK JOINT CONCRETE PRESSURE PIPE





▲ *Three edge bearing test in 300,000 pound capacity testing machine.*

◀ *Determining a pipe's beam strength in 300,000 pound capacity testing machine.*

Do you have conclusive proof of the fundamental characteristics of the pipe you intend using in your next water works project? Are you certain of its advantages? Do you recognize its limitations?

• • •

In Lock Joint's laboratory at Wharton, N. J. all guess work has been eliminated. Here, Lock Joint Pipes of all types and designs are tested to determine the exact extent of their ability to withstand back loads, beam loads and internal pressures. The most efficient modern equipment in the hands of highly trained personnel is used to give a tangible, practical demonstration of the high quality built into every type of Lock Joint Pipe.

• • •

These constant tests of our products are your assurance that, in its field, no finer pressure pipe than Lock Joint can be produced. Built in diameters from 16" upward and designed for any pressure common to water works practice, these pipes will serve you unfailingly for generations.

SCOPE OF SERVICES—*Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.*

**LOCK JOINT PIPE COMPANY**

*Established 1905*

**P. O. Box 269, East Orange, N. J.**

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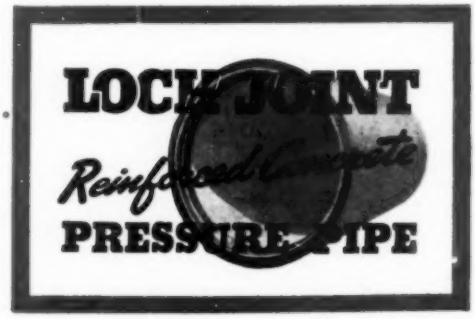

*"Dressing The Diver," lithographed on stone for U.S. Pipe and Foundry Co. by John A. Noble, A.N.A.*

**OUR FLEXIBLE JOINT PIPE** is highly regarded by water, gas and sanitation engineers for dependable service in submarine lines. For many years, it has been used in notable and difficult installations throughout the nation.

U. S. flexible joint pipe in all sizes, and pipe 30-inch and larger with other types of joints, are made by the pit cast process. Our pipe, 2-inch through 24-inch, is cast centrifugally in metal molds with bell-and-spigot, mechanical joint or plain ends. All of these types of pipe and joints are widely used for water, gas, sewerage and industrial service and are readily available to meet your requirements.

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**U.S.**
**cast iron**
**PIPE**
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE

# MERIDIAN, MISS.

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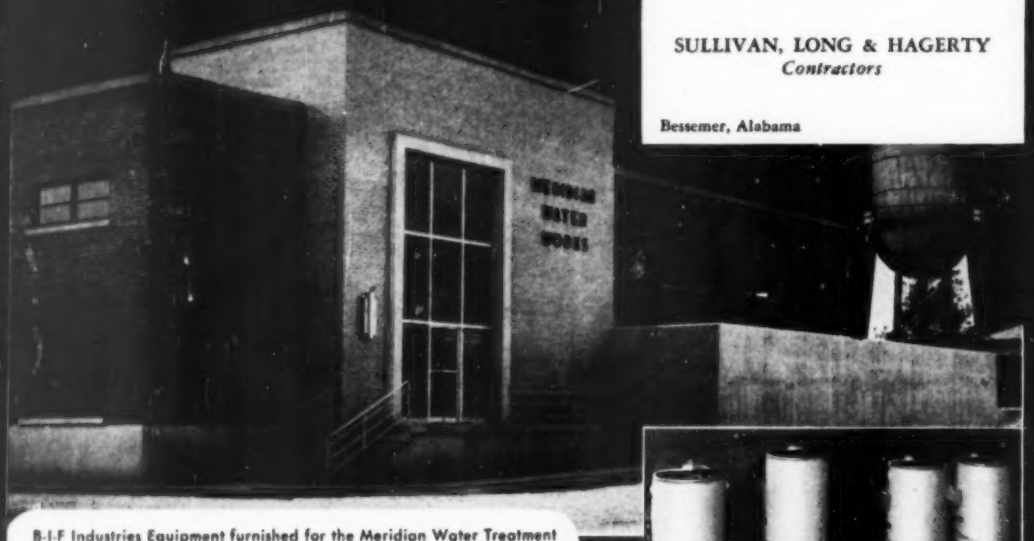
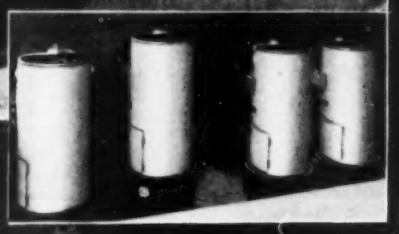
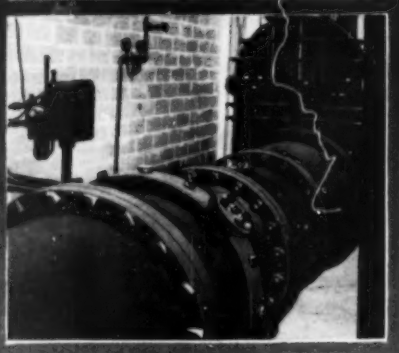
(Completed in 1951)

POLGLAZE & BASENBERG
*Consulting Engineers*
Birmingham, Alabama

SULLIVAN, LONG & HAGERTY
*Contractors*
Bessemer, Alabama





B-I-F Industries Equipment furnished for the Meridian Water Treatment Plant:

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Model LCA Basin Level Controller
24" VTS4 Venturi Tubes
CTUAX Chronoflo Transmitter
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10" Model RCE Filter Effluent Rate Controllers
Model GA6-I Loss of Head and Rate of Flow Gauges
Model FTPV-S Filter Operating Tables

**OMEGA**
Model 47A Disc Feeder with Dust Collector for feeding sodium fluoride

Model UF-2 Universal Feeders for feeding alum and hydrated lime

County seat of Lauderdale County and home of 42,000 people, this bustling industrial and agricultural center recently found its water supply facilities severely overtaxed. To remedy the inadequacy, the city financed the construction of this modern Water Treatment Plant.

The plant employs the latest in water treatment techniques: coagulation, flocculation, settling, filtration, chemical treatment, and fluoridation. It operates under the direction of R. C. Campbell, Superintendent. Included in the new plant are efficient Builders Flow Meters and Gauges and Omega Chemical Feeders. This equipment helps insure the high quality of finished water supplied by the plant.

For Bulletins describing Builders and Omega Water Works Equipment, address B-I-F Industries, Providence 1, Rhode Island.

B-I-F INDUSTRIES — A CENTURY OF QUALITY 1853

BUILDERS

OMEGA


WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. Published monthly by Gillette Publishing Co., at **404 North Wesley Ave., Mount Morris, Ill.** Entered as second class matter Mar. 4, 1948, at the post office at Mount Morris, Ill., under Act of March 3, 1879. For subscription rates, see Contents Page.

# WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT


## COMING ARTICLES

Trends & Developments in Sewage & Ind. Wastes—1952 ..... *Chase*
Safety in Water Works—Your and My Problem ..... *LaDue*
Sewage Works Practices (A series of Short Course articles*) ..... *Bloodgood*
Cost Control—Building Net Revenues ..... *Weir*
Slaughterhouse Waste Disposal by Digestion ..... *Rudolfs & Del Guercio*
Miami in the LIME-light; *and* at a Profit ..... *Wertz*
A Guide to Preventive Maintenance for Sewage Works ..... *McDonald*
Fluoridating Experiences at a Small Water Plant ..... *Ferringer*
Activated Silica in Water and Sewage Treatment ..... *Middleton*
Micro-straining of Sewage Effluents ..... *Finch*

*In this issue is the first of a series of short-course articles on *"Water Works Practices"* by "Doc" Symons. Installments of this series, and of a series on *Sewage Works Practices* by Prof. Don Bloodgood, will appear in alternate issues.


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# All Working Parts Contained in Removable Barrel... New Barrel Installed in Jiffy

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- With automobile accidents breaking an increasing number of hydrants, this speed of replacement is of tremendous importance in maintaining community fire protection.

**No Other Hydrant Offers So Many Essential Features:**

Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

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**TROPIC TYPE**
All-bronze, split case construction

**ARCTIC TYPE**
A bronze meter with breakable frost bottom

## ALL THESE VITAL PARTS NOW STAINLESS STEEL

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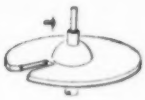

DIAL FACE ON STRAIGHT READING REGISTER . . . . .

GEAR TRAIN SCREWS

DIVISION PLATE . . . .

STUFFING BOX SPINDLE .

DRIVING DOG . . . .

You can't beat stainless steel for corrosion resistance and durability. That's why you find stainless used in Rockwell Disc meters wherever these superior qualities are required. It's just another indication of the high standards that Rockwell engineers into meters—another reason why Rockwell meters last longer and are so economical to repair.

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• Here in this one box are the repair parts recommended for a city placing 1,000 meters in service. Individual parts as well as complete assemblies are interchangeable, in all meters supplied during the past 30 years.

Improvements have been made in the construction of parts and in metallurgy to improve operation and increase life. But parts remain fully interchangeable to save your dollars. American Meters are still the simplest with the fewest parts.

*Ask for complete data.*

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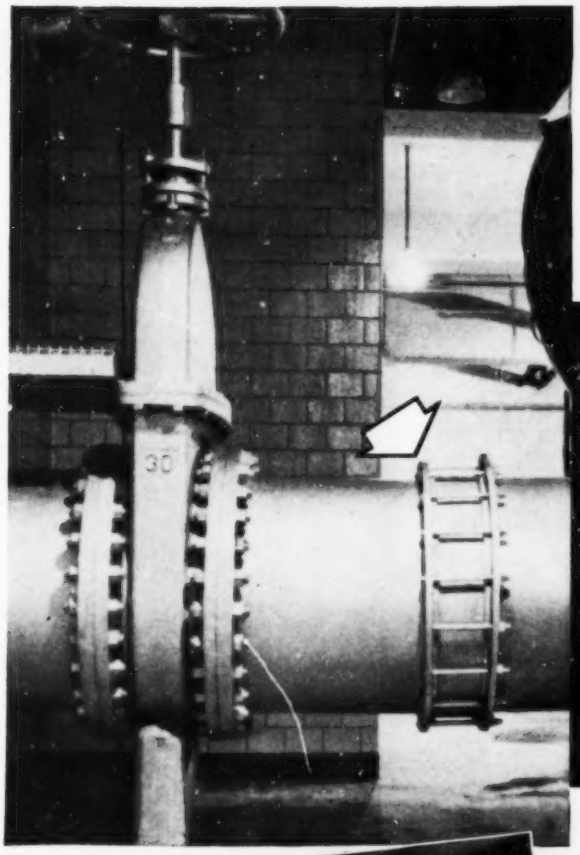
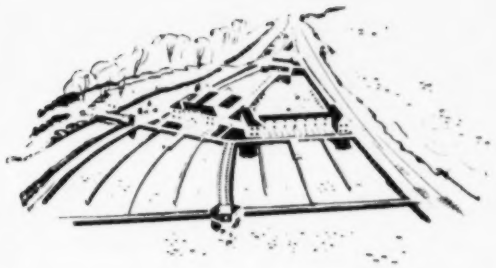




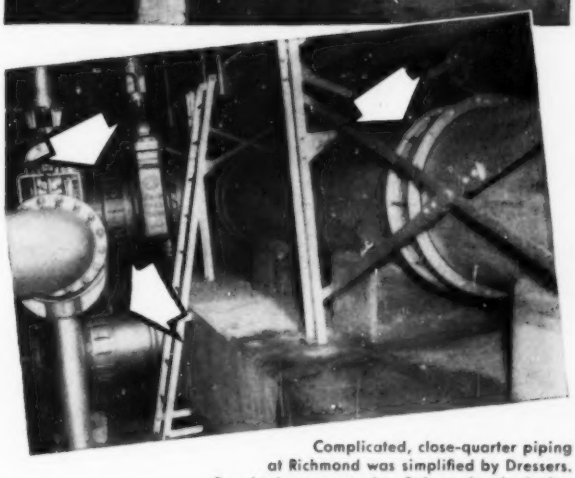
## at Richmond, Virginia...

# DRESSER COUPLINGS *Safeguard Big Valves*

Marsden C. Smith, Richmond's Chief Water Engineer, writing in *Water & Sewage Works*, says, "The design of the large valves controlling the filters in our No. 2 Purification Plant has been greatly improved by the use of 'plain ends' connected by flexible couplings. This eliminates dangerous stresses on the valve bodies, due to expansion and contraction, and also provides a simple means of replacing the valve, or its removal for repairs."

Dresser Couplings make big-pipe installations easier, faster . . . even in close, cramped quarters. Dressers can give or take as much as $\frac{3}{8}$", deflect as much as 4° or more.

Dresser Couplings eliminate expensive maintenance . . . assure lifelong dependability.



Complicated, close-quarter piping at Richmond was simplified by Dressers. Required no exact pipe fitting, absorbed pipe movement without leakage.

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# THE MEMBERSHIP OF A C.I.P. Century Club now has

**96%**

OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

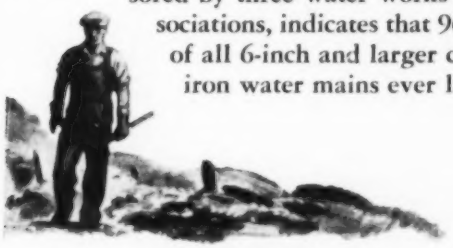
# CAST IRON PIPE

# DISTINGUISHED CLUB...
## 43 Members

The Cast Iron Pipe Century Club is probably the most unusual club in the world. Membership is limited to municipal, or privately-owned, water and gas supply systems having cast iron mains in service for a century or more.

Although the Club is formally constituted, there are no dues, no regular meetings, and no obligations other than to inform the Recording Secretary if and when the qualifying water or gas main is taken out of service, or, sold for re-use.

In spite of the unique requirement for membership, the Club roster grows, year by year. And why not, when a survey sponsored by three water works associations, indicates that 96% of all 6-inch and larger cast iron water mains ever laid



in 25 representative cities are still in service. And when answers to a questionnaire, mailed to gas officials in 43 large cities, show that *original* cast iron mains are still in service in 29 of the cities.

If your records show a cast iron main in service, laid a century or more ago, the Club invites you to send for a handsome framed Certificate of Honorary Membership. Address Thomas F. Wolfe, Recording Secretary, Cast Iron Pipe Century Club, Peoples Gas Bldg., Chicago 3, Illinois.

## CLUB ROSTER

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Lancaster, Pennsylvania
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Lynchburg, Virginia
MOBILE GAS SERVICE CORP.
Mobile, Alabama
MOBILE WATER WORKS COMPANY
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WATER DEPARTMENT
City of Zanesville, Ohio

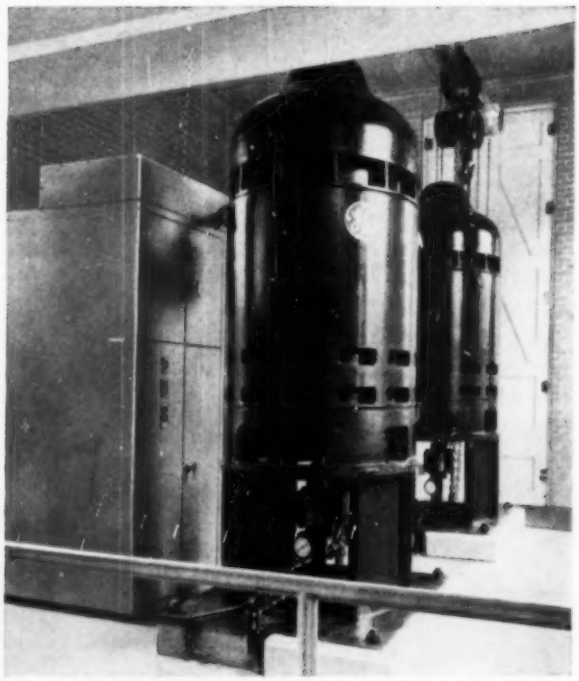
# SERVES FOR CENTURIES

ENGINEERING REPORTS:

**1 SUBURBAN PHILADELPHIA.** Here, in modernizing and expanding the Crum Creek Pumping Station, steam equipment was replaced with G-E motors and power-distribution equipment. As a result, output was increased by 5 mgd, operating efficiency improved by 20 per cent. Photo shows two G-E motors, rated 900 hp and 200 hp driving 15-mgd and 3-mgd DeLaval pumps. Latter is one of two. Motors are controlled from G-E metal-clad switchgear in rear.

# Three cities act now for

**3 WINSTON-SALEM, N. C.** Recent expansion has increased pumping capacity at High Service Station by 12 mgd. Shown are two of seven G-E motors, protected by G-E Limitamp control, which account for new 29½-mgd capacity.



At the Yadkin River Pumping Station, these G-E 600-hp vertical motors, controlled by G-E Limitamp panels, drive 4-mgd Worthington pumps. Consultants were J. D. Spinks of Winston-Salem and Albright & Friel of Philadelphia.

**2 LA GRANGE, GA.** This new water-treatment plant has a 4-mgd capacity. Only 68 per cent loaded, it will meet the city's needs till 1960. Plant and pump house operations are controlled by one man from this G-E Cabinetrol* control unit.

Incoming power for the plant is stepped down by three G-E 15-kva transformers. G-E engineers worked closely with Wiedeman & Singleton, consultants, J. H. Small & Co., contractors, and White Electrical Constr. Co., electrical contractors.

# more water tomorrow

## Install new G-E equipment to boost efficiency, meet present and future needs for greater capacity

These three cities—suburban Philadelphia, La Grange, Ga., and Winston-Salem, N.C.—are typical of many others throughout the nation that realize action is needed, and needed now, to prevent serious water-supply problems in the future.

In each case, whether it involved an entirely new installation or a modernization and expansion program, their objective was the same—to provide efficient increased capacity for today and tomorrow, to match the needs of a growing population, greater per-capita water consumption, and industrial expansion.

In each case, too, General Electric equipment was chosen for the electrical system, and G-E engineers offered valuable assistance on electrical system planning to municipal engineers and their consultants.

*Registered Trade-mark of General Electric Company.

This same kind of help can pay off for *your community's* water-supply program, too. G-E application engineers are ready to work closely with your engineers or consultants in developing a co-ordinated electrical system to meet your community's requirements. For best results, call in your G-E Apparatus Sales representative early in the planning stage.

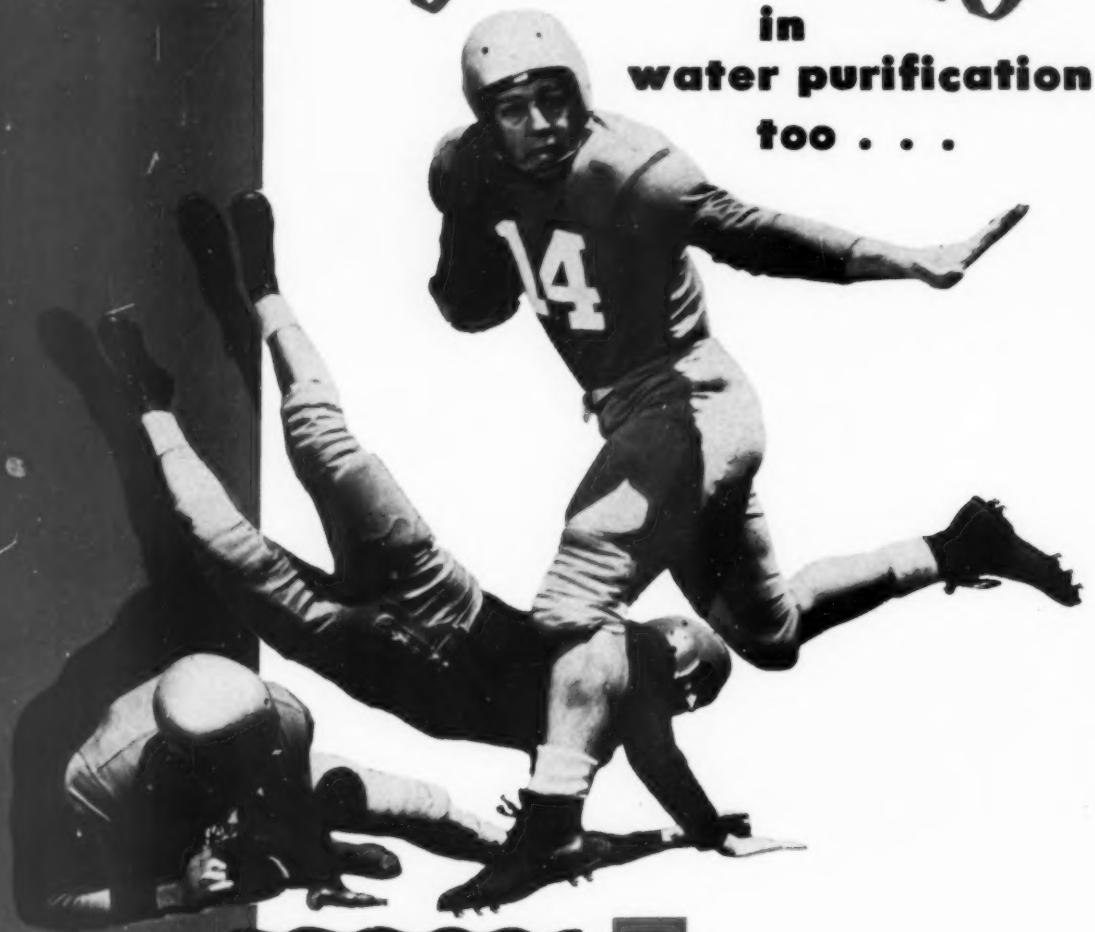
**MAKE YOUR COMMUNITY WATER-SUPPLY CONSCIOUS**

Dramatize the need for an adequate water supply by showing the new color movie "Pipeline to the Clouds." It's part of G.E.'s *More Power to America* Water Supply Program. Contact your local G-E Apparatus Sales Office or write on your letterhead for Bulletin GEA-5555 to General Electric Co., Section 666-74, Schenectady 5, N. Y.

**Engineered Electrical Systems for Waterworks**

**GENERAL ELECTRIC**

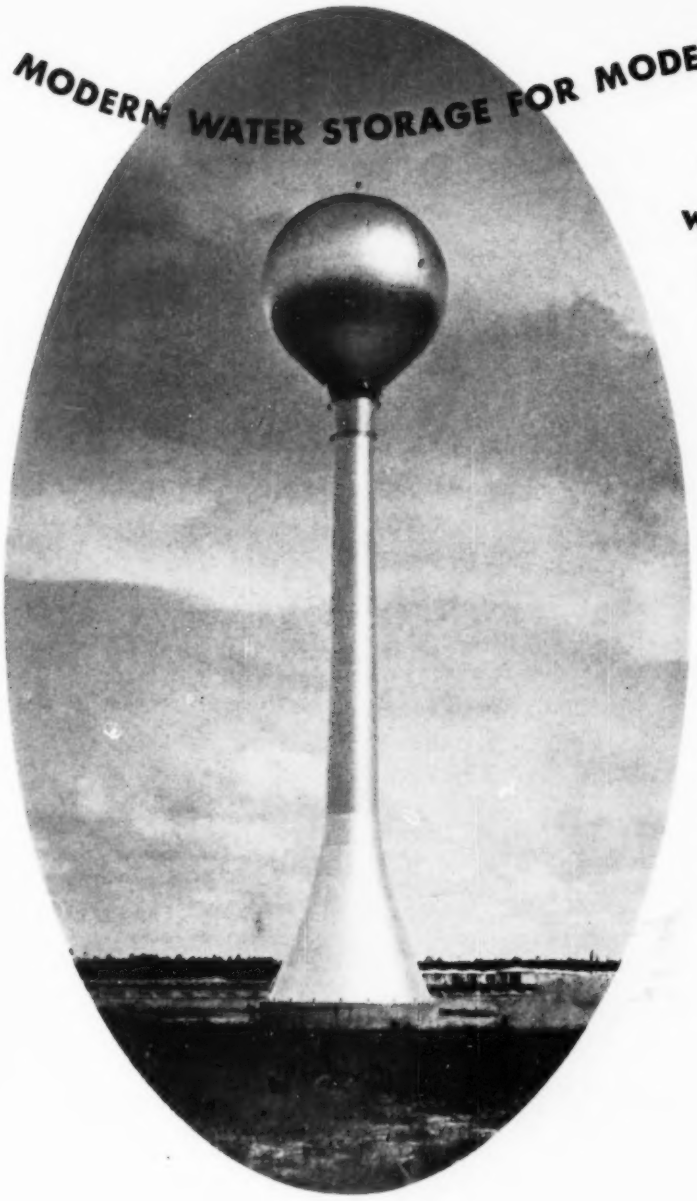
it takes team work in water purification too . . .



industrial CHEMICAL SALES
division west virginia pulp and paper company

THOSE of us who have played football know the futility of trying to carry the ball for a gain without blockers and team work up ahead. And probably many of you water plant managers have had your moments of frustration when tackling a tough taste and odor problem all by yourself. That's just where the Aqua Nuchar Technical Service team comes to your rescue. They are available without obligation to help you with any current problems and to make a thorough threshold odor survey of your plant. Such a test will usually determine the right combination that will give you optimum taste and odor control. The two components that combine to give maximum efficiency and economy in water purification are: (1) The most advantageous spot in your plant to apply the carbon, and (2) the minimum amount of Aqua Nuchar that will give maximum taste and odor removal.

# MODERN WATER STORAGE FOR MODERN HOMES DEVELOPMENT



*150,000-gal. Horton Watersphere, 116 ft. to bottom, designed to withstand 150 mile per hour winds, installed at Richmond Heights, Florida. Rader Engineering Company of Miami were Consulting Engineers on this job.*

## Horton Watersphere in water system serving new Florida housing project

This 150,000-gal. Horton Watersphere provides gravity pressure in the water system serving a new, modern housing development at Richmond Heights, Florida.

Richmond Heights is a new community with over 1,000 single family dwellings. Even though it is only about 12 miles south of Miami, the water system, operated by the Richmond Heights Utility Corporation, is entirely independent. Water is obtained from wells on the property, treated and pumped into the distribution system.

For water systems of moderate size, such as the one in Richmond Heights, Florida, the Horton Watersphere provides an efficient, dependable means of maintaining uniform pressure in the distribution system. The Watersphere is not limited, however, to municipal use. Institutions and industrial plants needing a water supply for fire protection or general service find this type of structure ideal both in design and performance.

Horton Waterspheres are built in capacities from 25,000 to 250,000-gallons. For further details, write our nearest office.

### OTHER TYPES OF HORTON WATER STORAGE TANKS

Horton ellipsoidal-bottom elevated tanks. Built in capacities from 15,000 to 500,000 gallons. Used for municipal water systems and for sprinkler service at industrial plants.

Horton radial-cone bottom elevated tanks. Available in capacities from 500,000 to 3,000,000 gallons. Shallow depth makes possible large tank capacity with minimum range in head.

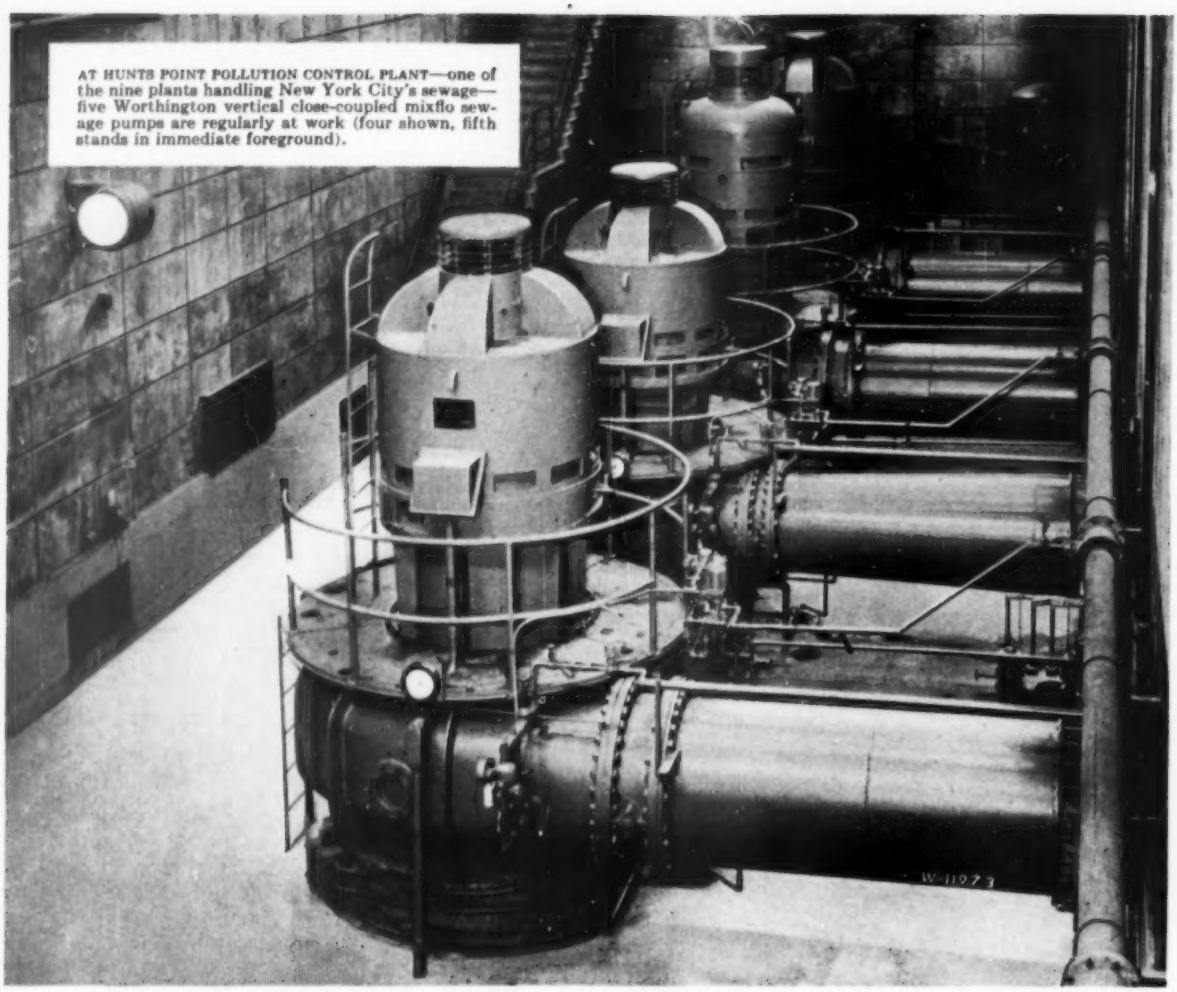
**HORTON**

WELDED STEEL STORAGE TANKS

**CHICAGO BRIDGE & IRON COMPANY**

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

| | | | |
|---|---|---|---|
| Atlanta 3 | 2181 Healey Bldg. | Los Angeles 17 | 1555 General Petroleum Bldg. |
| Birmingham 1 | 1586 North Fiftieth St. | New York 6 | 3390—165 Broadway Bldg. |
| Boston 10 | 1048-201 Devonshire St. | Philadelphia 3 | 1644—1700 Walnut Street Bldg. |
| Chicago 4 | 2198 McCormick Bldg. | San Francisco 4 | 1583—200 Bush St. |
| Cleveland 15 | 2262 Midland Bldg. | Seattle 1 | 1350 Henry Bldg. |
| Detroit 26 | 1551 Lafayette Bldg. | Tulsa 3 | 1646 Hunt Bldg. |
| Houston 2 | 2115 C. & I. Life Bldg. | Washington 6, D. C. | 1109 Cafritz Bldg. |



AT HUNTS POINT POLLUTION CONTROL PLANT—one of the nine plants handling New York City's sewage—five Worthington vertical close-coupled mixflo sewage pumps are regularly at work (four shown, fifth stands in immediate foreground).

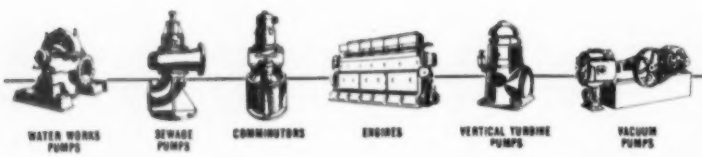
# 1689 mgd of New York City's Treated Sewage handled by Worthington pumps

If you want to see Worthington sewage pumps—large and small—at work, you can't go wrong by looking inside six of the nine major disposal plants that serve the City of New York. A total of 1689 mgd installed capacity of Worthington sewage pumps are now in regular use in the world's largest city.

New York's installed capacity of sewage pumps is among the largest in the U. S., so you'd naturally expect the city's public works officials to be familiar with Worthington performance—performance that years ago gave Worthington its position as world leader in the manufacture of pumping equipment.

Hundreds of *smaller* municipalities across the country know Worthington, too, not only for sewage pumps but for water-works pumps, comminutors, engines and other public works equipment. *Worthington Corporation, Public Works Division, Harrison, New Jersey.*

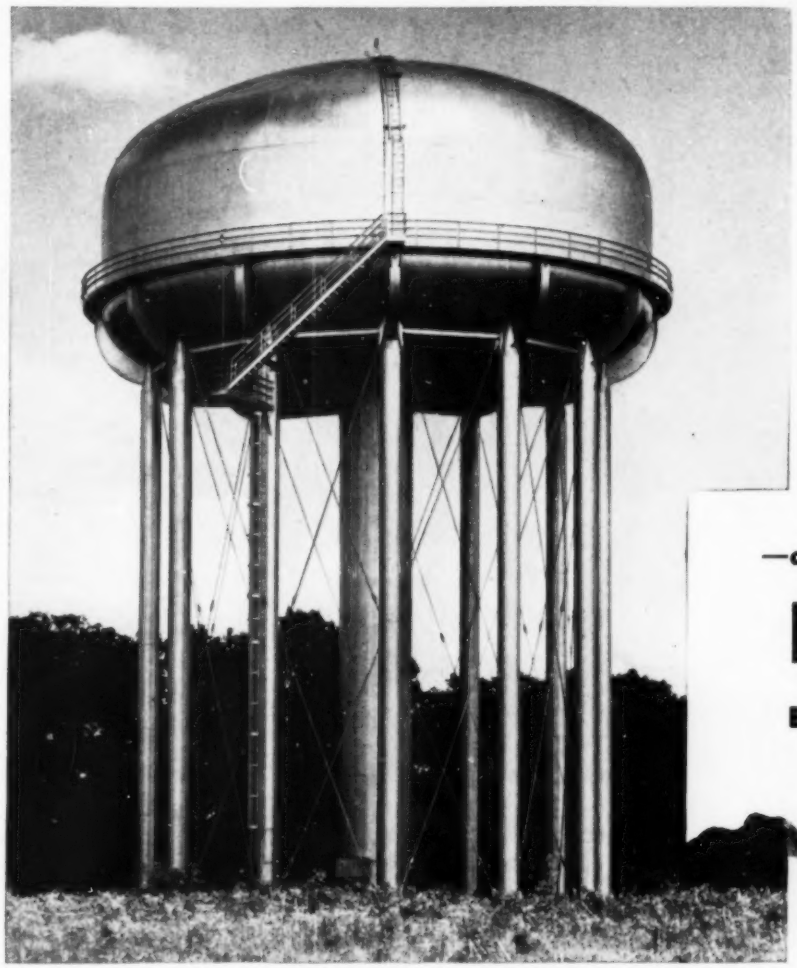
W.2.3




**All Major Public Works Equipment Under One Responsibility**

**WORTHINGTON**

Public Works Equipment



for

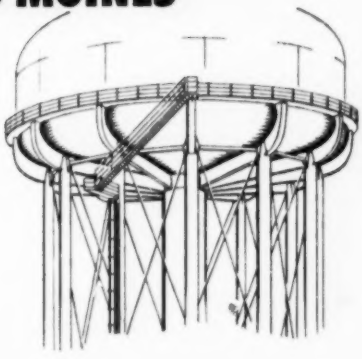
Cincinnati, Ohio

*—a million gallon*

# RADIAL CONE

**ELEVATED STEEL TANK**

## *by* PITTSBURGH • DES MOINES



**The *Radial Cone* design is particularly applicable for elevated tanks of medium to large capacity where *low head range* is an important consideration. • Write for a discussion of the Pittsburgh-Des Moines elevated tank type best meeting *your* requirements.**

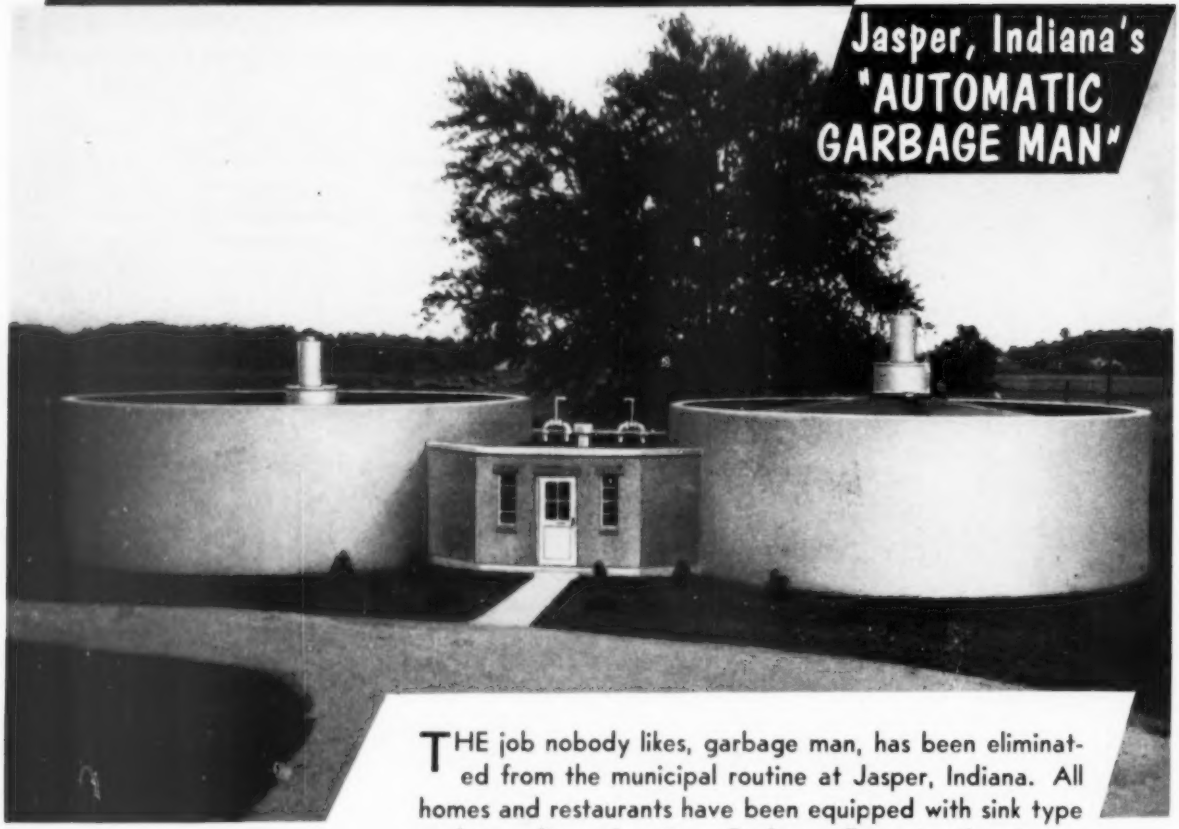
**PITTSBURGH • DES MOINES STEEL CO.**

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

| | |
|---|---|
| PITTSBURGH (25), . . . 3418 Neville Island | DES MOINES (8), . . . . . 919 Tuttle Street |
| NEWARK (2), . . 218 Industrial Office Bldg. | DALLAS (1), . . . 1223 Praetorian Building |
| CHICAGO (3), 1222 First National Bank Bldg. | SEATTLE . . . . . 526 Lane Street |
| LOS ANGELES (48) . . 6399 Wilshire Blvd. | SANTA CLARA, CAL. . . . 625 Alviso Road |

# P.F.T. CONTROLLED DIGESTION is a vital part of Jasper, Indiana's "AUTOMATIC GARBAGE MAN"



THE job nobody likes, garbage man, has been eliminated from the municipal routine at Jasper, Indiana. All homes and restaurants have been equipped with sink type garbage disposal units. Garbage flows to the Jasper Wastes Treatment Plant along with the sewage.

P.F.T. Controlled Digestion is a vital part of the plant. It assures effective digestion of garbage and sewage solids and maximum utilization of the increased quantities of sludge gas produced due to the addition of the garbage solids. Controlled Digestion, at Jasper, includes two 40' - 0" diameter P.F.T. Floating Cover Digesters with total capacity of 68,840 cu. ft. . . . a P.F.T. #250 Digester Heater and Heat Exchanger equipped for gas and oil firing, with type "C" controls. . . . P.F.T. Supernatant Selectors in both digestion tanks with Supernatant Liquor Gauges, Sight Glasses and Samplers in the Control Room . . . . a full complement of P.F.T. Gas Safety Equipment for safe transmission and utilization of sludge gas.

Optimum temperature in the digester tank is highly important and is assured by the automatic controls of the P.F.T. Digester Heater and Heat Exchanger.

The plant is designed for a populatien loading of 10,000. Couch & Kulin, Consulting Engineers, Indianapolis, Ind., designed the plant.

P.F.T.

**PACIFIC FLUSH TANK CO.**

*Waste Treatment Equipment Exclusively Since 1893*

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

# HARD DIGGING EASY LAYING

IT TAKES a lot of digging and hard labor to provide a trench for water pipe like the one illustrated. The rock had to be removed, special bedding installed and backfill carefully selected and handled; a requirement with any kind of water main.

But it takes little time to install "Century" Asbestos-Cement Pipe and Simplex Couplings.

And once installed "Century" Asbestos-Cement Pipe assures full flow area over the years, because it cannot rust and will not tuberculate.

For nearly 40 years Asbestos-Cement pressure pipe has been successfully used as a water carrier and its strength actually increases.

A worthy successor to Gunga Din is "Century" Pipe. We would like to tell you more about it.

*Write* for FREE BOOKLET, "Mains without Maintenance". Gives valuable data, specifications, and reference material for anyone interested in water main pipes.

*Nature made Asbestos . . .*
*Keasbey & Mattison has made*
*it serve mankind since 1873*

**KEASBEY & MATTISON**
COMPANY • AMBLER • PENNSYLVANIA

## NO NEED to specify over-sized pipe . . .

## NO WORRY over low flow capacity . . .

## NO NEED to buy bigger and bigger pumps

# . . . when you protect pipe lines with BITUMASTIC® 70-B ENAMEL

PIPE LINES don't "shrink" when interior surfaces are coated with a spun lining of Bitumastic 70-B Enamel. This durable enamel *prevents* rust, corrosion, incrustation and tuberculation.

When the inside diameter of your pipe lines *stays* the same through the years, you select pipe solely on the basis of desired capacity. You don't waste money by specifying *over-sized* pipe in order to allow for future "shrinkage." When your pipe line's coefficient of flow *stays* high, you don't have to replace pumps with bigger ones that cost more to buy and operate.

Bitumastic 70-B Enamel is equally effective in protecting exterior surfaces of pipe lines. It prevents pitting and leakage caused by soil corrosion. Give your steel pipe lines *lasting* protection, inside and out, with Bitumastic 70-B Enamel. Write for full information.

KOPPERS BITUMASTIC ENAMELS

REG. U.S. PAT. OFF.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 161-T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

# engineered instrumentation *helps fight stream pollution*

*pH and Redox control* by ***ElectroniK*** instruments assure thorough neutralization and reduction of waste liquor in a large electroplating plant.

YOUR plant's part in the "clean streams" program brings up an engineering problem—the treatment of industrial wastes and sewage. And it can be worked out most effectively through the use of soundly engineered methods of measurement and control.

You can count on Honeywell for the right instrumentation—applied the right way for your installation. You'll benefit by the extensive experience that Honeywell has gained through close cooperation *with consulting engineers* and plant technicians, on all types of treatment problems. At your disposal is a complete line of instruments for filtration, chlorination, aeration, drying, flotation, incineration and other specific processes—literally everything your treatment plant needs for automatic, centralized control.

Our local engineering representative will welcome the opportunity to discuss instrumentation with you and your consulting engineer. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4575 Wayne Ave., Philadelphia 44, Pa.

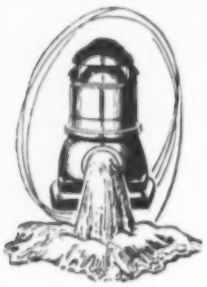
● **REFERENCE DATA:** Write for new Bulletin 1550—"pH and Conductivity Recorders and Controllers," and for new Bulletin 7302—"Water and Sewage Instrumentation."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

*First in Controls*

# WATER for Atlantic City's RITZ-CARLTON



**DATA:**

- —WELL; Drilled by rotary clay-seal process, 850 feet deep in the Kirkwood stratum; double cased and graveled.
- —CASING; 145 feet of 16" and 747 feet of 12" steel.
- —SCREEN; 61 feet of 6-guage Armco Iron.
- —PUMPS; Originally equipped with 4-stage 15" bowls with cast iron impellers. Later replaced with 5-stage 12" bowl and bronze impeller.
- —MOTOR; Original 25 HP electric still giving good service.

On Atlantic City's famous board walk, stands one of America's loveliest hotels—the Ritz-Carlton. Twenty-eight years ago, the owners turned to Layne for a well and pump installation. In the intervening years—over a quarter century, they have never experienced one fraction of disappointment in the dependability, durability and ever faithful performance of their purchase.

In the twenty-eight years of almost constant operation, the Layne unit has produced more than 1,471,680,000 gallons of water—all the fresh water needed by this great hotel. Upkeep expense since the day installed has averaged less than a hundred and seventy dollars a year. One amazing fact is that the original Armco iron screen is still functioning. Another is that the well was installed by a method that completely sealed off all infiltration of salt water in a most difficult salt water area. Such is the life expectancy, satisfactory operation and generally low upkeep expense of Layne wells and pumps.

*For Water Well and Pump Catalogs, write to*

Layne & Bowler, Inc.

**GENERAL OFFICES, MEMPHIS 8, TENN.**

Layne

*There are Layne Associate Companies located throughout the country. The one near you already understands the drilling and water bearing formations in your area.*

**WATER WELLS**
**VERTICAL TURBINE PUMPS**
**WATER TREATMENT**

# . . . it's the new RING-TITE JOINT used with Transite Sewer Pipe

NO NEED TO LET ordinary time-consuming methods of making joints slow down your sewer line jobs—not when you install Transite* Sewer Pipe with its new Ring-Tite Coupling.

Just a simple assembly operation with a mechanical coupling puller and this new "packaged" joint is ready for business! No jointing compounds to bother with . . . no heating equipment . . . no special skill is required. And you can check each joint for proper assembly as soon as it is made—*before backfilling.*

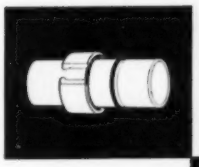
Moreover, this easily assembled Ring-Tite Coupling makes a tight joint that *stays* tight in service. This, plus the fact that Transite's long 13-foot lengths mean *fewer* joints in the line, cuts infiltration to a minimum. As a result, treatment costs are reduced, plant capacity conserved for future needs.

Another money-saving advantage of this asbestos-cement pipe is its high flow capacity (Manning's n=.010). This often permits flatter grades and shallower trenches — a particularly important economy where pipe is laid at or below the ground water line or where rock excavation is required.

May we send you more complete data? Address Johns-Manville, Box 60, New York 16, N. Y. Ask for folder TR-103A.

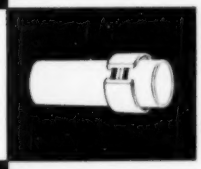
*Transite is a registered Johns-Manville trade mark

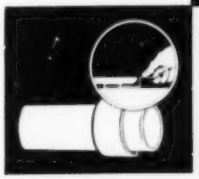
## HERE'S HOW THE RING-TITE JOINT WORKS:



**Start of assembly.** Two rubber rings and a Transite sleeve (cut away to show position of the rings) are placed on one of the two pipe ends to be joined.

**Final position.** Sleeve centered over both pipe ends, with the rubber rings tightly compressed between sleeve and pipe.



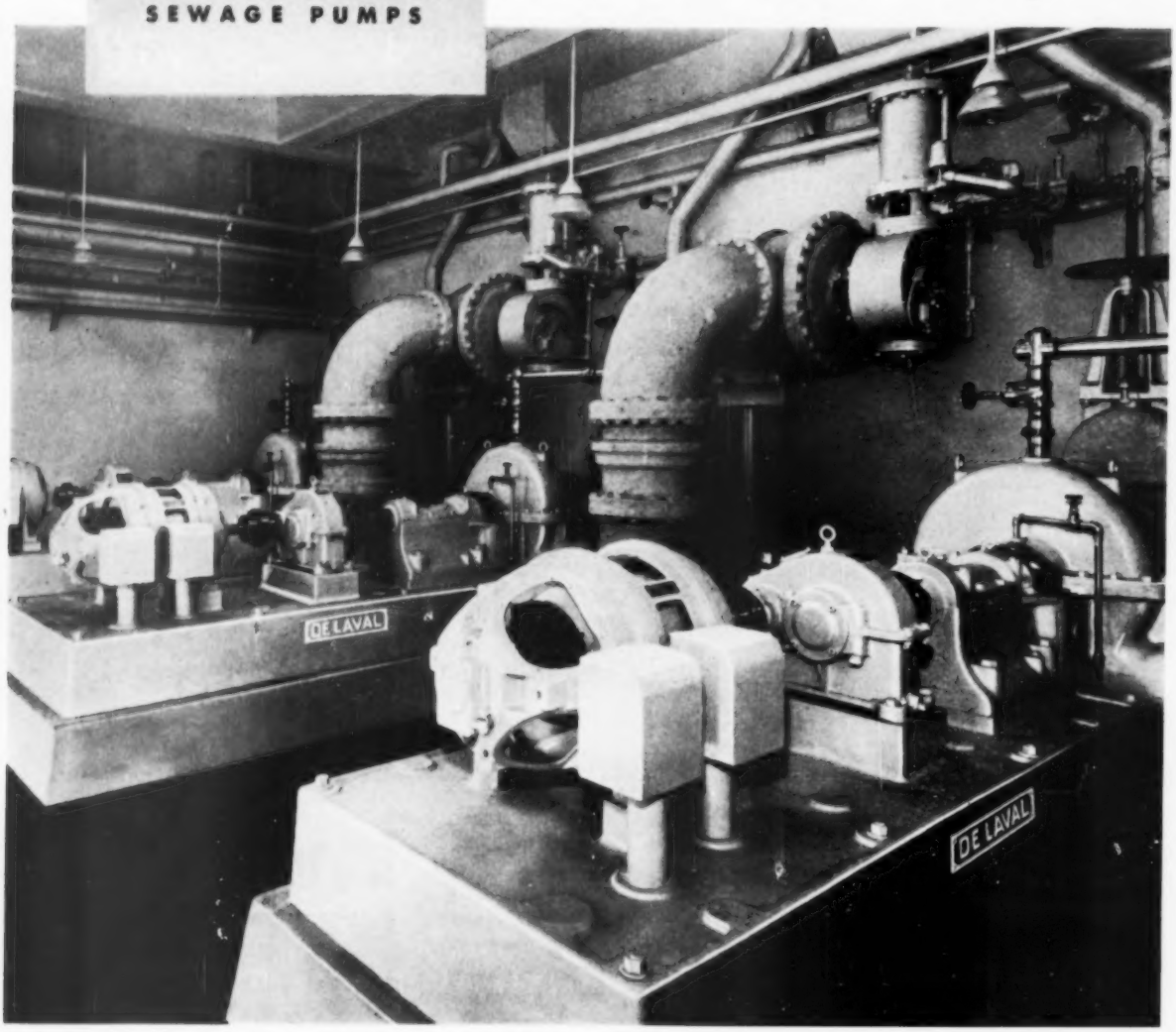


**Checking joint** for proper assembly. This is done with a simple gauge immediately after the joint is made . . . *before backfilling.*

JOHNS MANVILLE JM PRODUCTS

## Johns-Manville TRANSITE SEWER PIPE

# DE LAVAL SEWAGE PUMPS *serve Baltimore's new plant*




Three De Laval sewage pumps are on the job in the City of Baltimore's new Brooklyn Sewage Pumping Station built for today's need and planned for future expansion.

Two of these high efficiency motor-driven horizontal pumps have a capacity of 3,000 gpm and the third has a capacity of 7,000 gpm. Later, as flow increases, the two 3,000 gpm units can be replaced by a 7,000 gpm pump.

Slow speeds of these De Laval pumps insure long life, large passageways reduce clogging and nickel-chrome cast iron casings and impellers assure long wear.

Baltimore is another of a long list of cities being served by De Laval pumps. A complete centrifugal pump line is built on 50 years experience at De Laval—pioneer in the municipal pumping field.

**DE LAVAL** *Sewage Pumps*

DE LAVAL STEAM TURBINE COMPANY
*324 Nottingham Way, Trenton 2, New Jersey*

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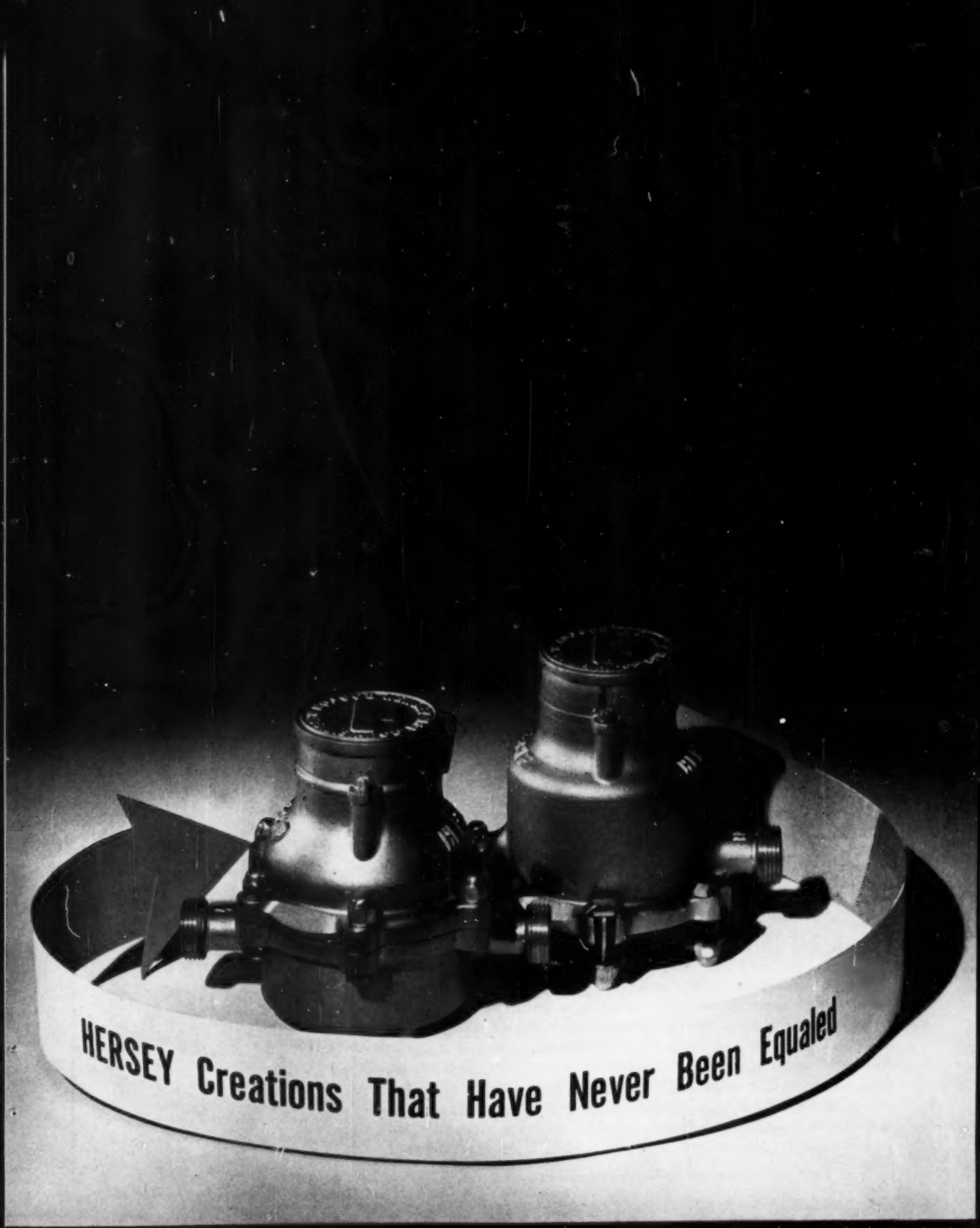


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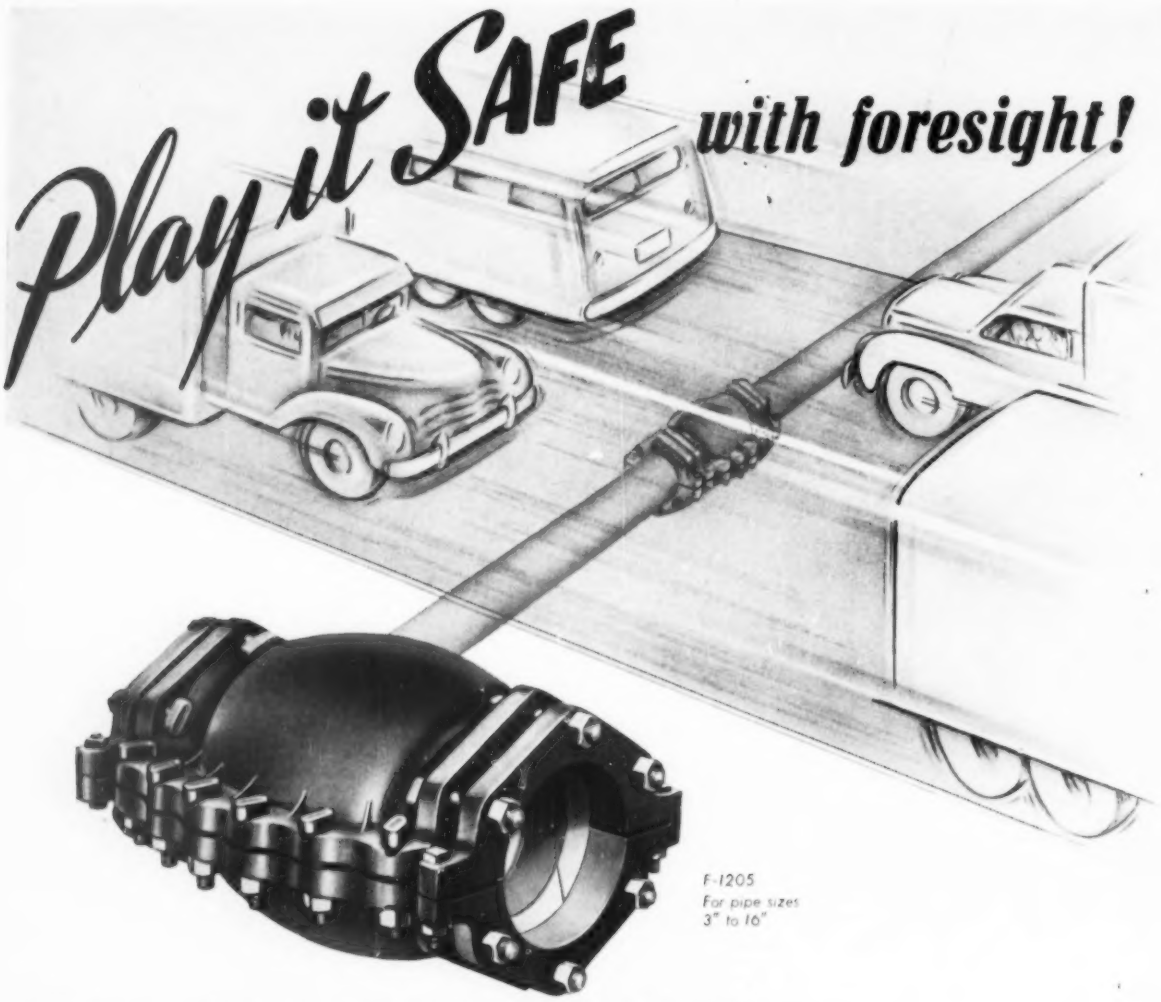
# Play it SAFE with foresight!



F-1205
For pipe sizes
3" to 16"

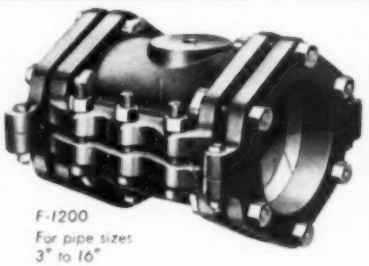
## *Reinforce all joints subject to vibration with*

# CLOW

## Mechanical Joint BELL SPLIT SLEEVES

When ponderous trucks roar and rumble by, even our finest highways tremble with vibration . . . and so does the water pipe buried below! That's why it's best to play it safe: don't wait for a break; have the foresight to install Clow Mechanical Joint Bell Split Sleeves as *original equipment* wherever the pipe must pass under highway truck routes or under railroad tracks. Specify them for marshland or under water, too—in fact, everywhere that pipe is not readily accessible in case of emergency. They're easy to install . . . no lead, no jute, no caulking!

*Write for circular with helpful information and illustrations*



F-1200
For pipe sizes
3" to 16"

Use these F-1200 Clow Mechanical Joint Straight Split Sleeves for permanent repairs to pipe barrels. 12" and smaller sizes will repair lengthwise breaks up to 8 inches; 14" and 16" sizes, up to 17 inches.

**JAMES B. CLOW & SONS**

**201-299 North Talman Avenue • Chicago 80, Illinois**

**and their National Cast Iron Pipe Division, Birmingham, Alabama; subsidiaries Eddy Valve Company, Waterford, N.Y.; Iowa Valve Company, Oskaloosa, Iowa**

# Why Corrosion Costs You More Than Wrought Iron...

When you see a pipe repair job in progress, the economy of using durable material becomes obvious. Original installations are quickly made by pipe fitters. But repairs call for hours of work by as many as five crafts: pipe fitter , mason , carpenter , plasterer , painter . Thousands of users in every industry are finding the profitable answer in Byers Wrought Iron pipe . They know that "cost per year of service" is the only true measure of economy. Service records have proved that Byers Wrought Iron pipe is still good after serving three or four times longer in areas where vulnerable pipe has failed.


With today's maintenance costs on the increase, selecting the pipe that lasts longer, at lower cost per year, is more important than ever before. The wide-spread and continued use of Byers Wrought Iron pipe in installations where corrosion is a threat to service life endorses the material's ability to give this essential durability. You'll find the facts responsible for this greater "life-span" in our bulletin, THE ABC's OF WROUGHT IRON. Write for your copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N.Y.

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CORROSION COSTS YOU MORE THAN WROUGHT IRON

**WROUGHT IRON**

**TUBULAR AND HOT ROLLED PRODUCTS**

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

# Jacking Concrete Pipe Under Roadbeds Saves Time and Money

This photo shows how concrete pipe can be installed quickly and easily by jacking it under highways, streets and railroads without interrupting traffic.

It's another example of how sturdy concrete pipe meets any combination of site conditions or drainage requirements.

Jacking concrete pipe usually permits substantial savings in installation costs. It minimizes roadbed disturbance and thus reduces or eliminates costly maintenance often caused by trench settlement.

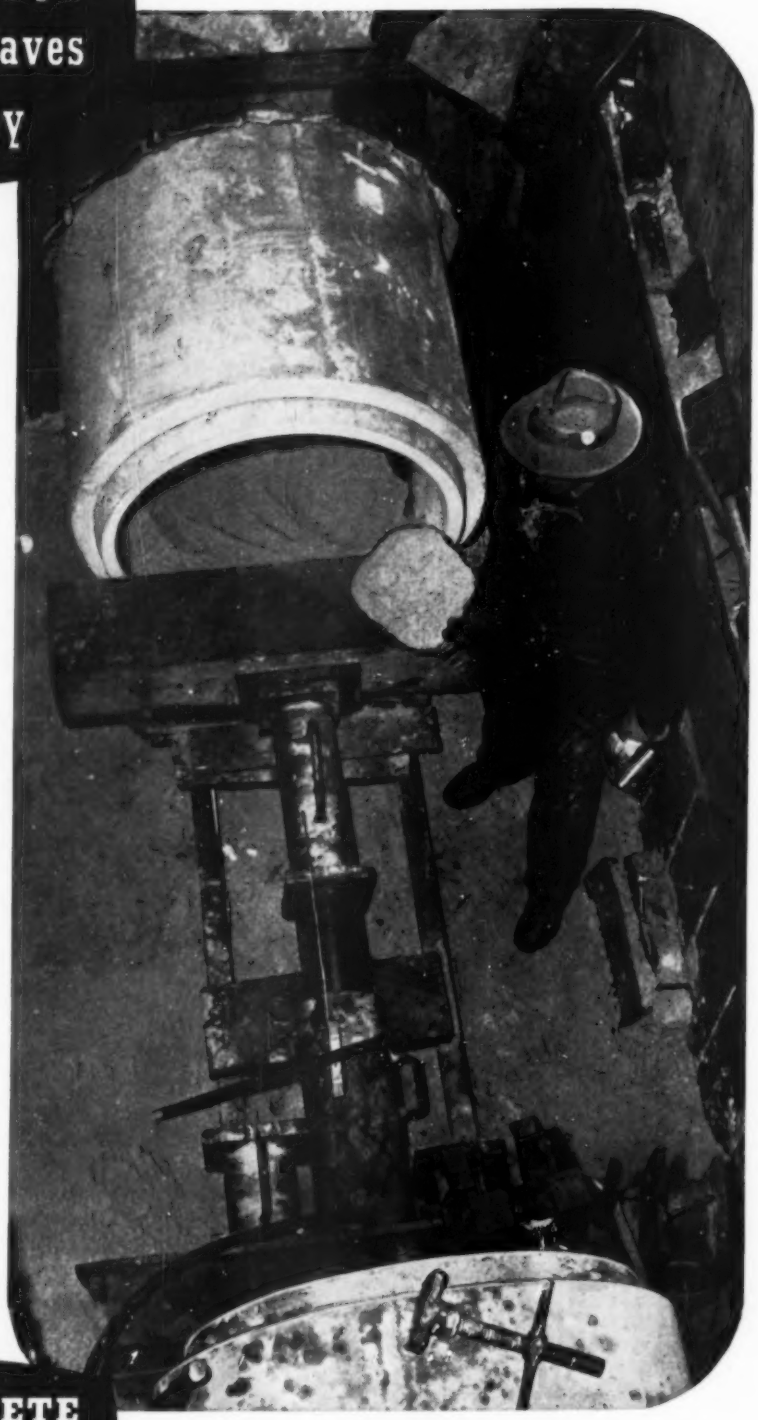
Concrete pipe has the rugged strength to withstand the forces required in jacking. It also stands up under heavy traffic impact, severe soil and climatic conditions and high fill loads.

In addition to its superior strength and ease of installation concrete pipe has:

1. **MAXIMUM HYDRAULIC CAPACITY**—assured by smooth interior walls and clean, even joints.

2. **EXTRA LONG LIFE**—proved by long years of dependable service in thousands of installations.

3. **OUTSTANDING ECONOMY** — moderate first cost, long life and little or no maintenance expense add up to *low annual cost* — the true measure of pipe line performance.



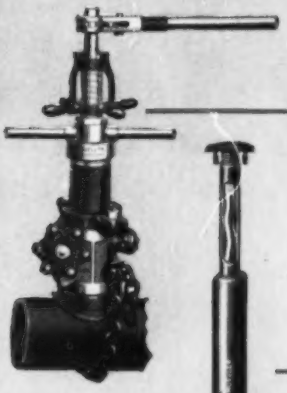
Jacking 36-inch concrete pipe under 14 lines of railroad track at Gary, Ind. The end of 50 feet of pipe jacked into position is shown in lower part of photo. This section is being used as backstop for jacking pipe in opposite direction.

**AMERICAN CONCRETE PIPE ASSOCIATION**
228 NORTH LA SALLE STREET
CHICAGO 1, ILLINOIS

# MUELLER®

## Quality Products

## FOR THE WATER WORKS INDUSTRY



**MODEL "B" WATER TAPPING MACHINE** — For tapping water mains and inserting corporation stops 1/2" to 1" inclusive, under pressure. Will make dry taps only from 3/8" to 2-1/2". Can be equipped for pressures up to 400 lbs. p.s.i.

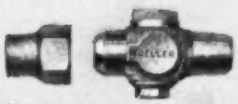
**COPPER SERVICE PIPE COUPLINGS H-15425** — Mueller couplings and connections are available in a variety of types and styles. This includes couplings, 1/8 and 1/4 bend connections, and unions.

**EXTENSION SERVICE BOXES H-10314** — Adjustable service box telescopes to protect box and service line from damage by heavy trucks, etc. striking the box. Easily adjusted for changing grade levels.

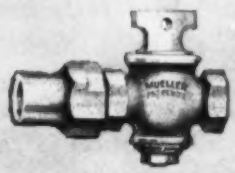
**FIRE HYDRANTS** — Improved Mueller Fire Hydrant has special break-away stem coupling and unique safety flange to prevent damage to hydrant barrel, stem, and working parts.

**GATE VALVES** — Available in sizes from 2" to 48" with either rising or non-rising stem, hand or power operated, and with or without by-pass valve. Positive closure. High strength.

**CORPORATION STOPS H-15000** — For insertion under pressure with Mueller Tapping Machines. May be obtained with a variety of threads, patterns and types. For use with cast iron, steel, wood mains, and service clamps.



**GROUND KEY CURB STOPS H-15275** — Ground Key Curb Stops are available in solid Tee Head Round Way, and Inverted Key styles with a variety of inlets and outlets, and patterns.



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***"Every individual connected with water purification or sewage works should subscribe to this publication. I have introduced it to a host of friends in this field"***

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- *If you are interested in the water field only you get all the authoritative data on this subject.*
- *If you are interested in sewage problems only you are kept fully informed and given much help in this field.*
- *If you are interested in both subjects you get all the information in this one monthly magazine.*

# IN OMAHA ... IPE

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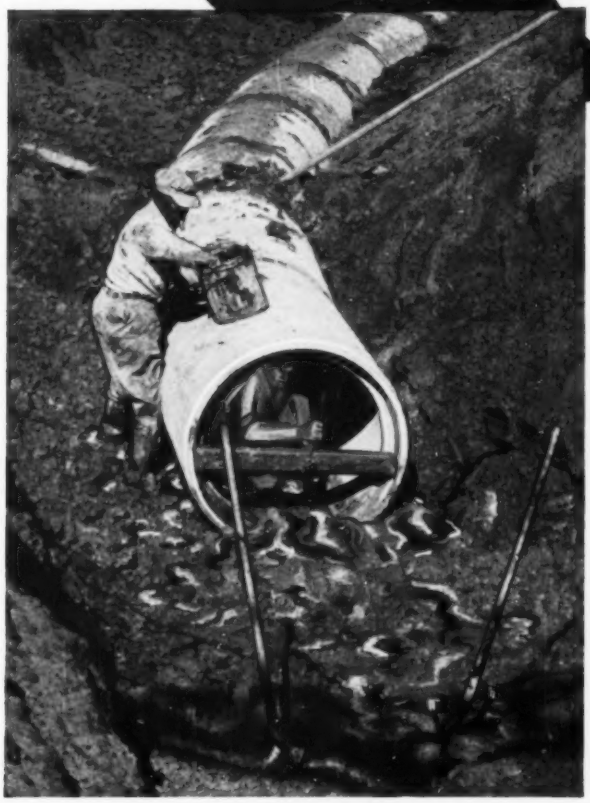
WITH

# TYLOX

*flexible rubber*

# JOINTS



Laying concrete sewer pipe "on radius" is always a tough proposition. But, it's extra tough when the ditch is wet and when you must have tight joints.

That was the triple problem facing the engineer and contractor on Omaha's new section of storm sewer. They needed a coupling that would permit angularity; that could be applied in a wet ditch without grouting; that could compensate for shifting soil stresses; and, that would give tight joints that stay tight.

They found the answer in TYLOX—the flexible, rubber coupling that makes lines "leakproof for life." TYLOX slips onto the pipe quickly and easily. There's no grout to harden—no need to worry about mud, or water. The coupling is fast. The pipe just slide together. And, there's no waiting to back-fill. As soon as the pipe is coupled, the ditch can be filled.

What's more, a TYLOX joint is flexible—and, stays that way. Rubber under compression and underground lasts indefinitely. It gives a tight seal that automatically adjusts for shifts in soil — that readily conforms to angling the pipe around curves.

Why not look into TYLOX, today? Engineers and contractors the world over have found it the economical, efficient answer to the toughest of pipe line installations.

**Thumbnail Facts**
**About Omaha Storm Sewer No. 1744**

Location: From 41st & Blondo west to Parker St.
Pipe: T & G, Concrete Pipe, Supplied by Wilson Concrete Co., Red Oak, Iowa:

558 lineal feet—36" bore—ASTM C-75-41
52 lineal feet—30" bore—ASTM C-75-41

Data on Curves Made with TYLOX JOINTS:

1. Radius—56.5 feet
   Angle—47° 44'
   Tangent—25
2. Radius—65.525 feet
   Angle—47° 12'
   Tangent—30
3. Radius—47.32 feet
   Angle—55° 42'
   Tangent—25

**Sanitation Engineer: William Provosnik**
**Contractor: Sesto Construction Co., Omaha, Nebraska**

**Making Joints with TYLOX RUBBER GASKETS Is as simple as A B C**

Cement tongue and snap on Tylox gasket.

Lubricate sliding surfaces with Tylox Cement.

Shove the pipe home.

1745

**HAMILTON KENT**

MANUFACTURING COMPANY

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*"THE ONLY PERMANENTLY TIGHT LINES ARE LAID WITH RUBBER JOINTS"*

# NOW

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## *To the dangers of High Voltage!*

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THE OLD . . . STANDARD CONTROL. Fuses are Live and operator is Exposed to High Voltage When Fuse Compartment is Opened. Hook-Stick Always Needed.

**THE NEW "SA-FUSE" CONTROL**

**Fuses are *Dead* and *Grounded***

Operator is Shielded From Live High Voltage Parts When Fuse Compartment is Opened.

The fuses in the "Hi-Fuse", High-Voltage, High-Interrupting Capacity Motor Control above are being handled with the following safety assurances: (1) *that the fuses are completely disconnected from the circuit,* (2) *that the fuses are grounded,* (3) *and that a heavy insulating barrier shields the operator from high voltage.*

These new important safety features are now provided by the new SA-FUSE compartment for Hi-Fuse Control. When the fuse door is opened, a gang-disconnect separates the fuse panel from the high voltage circuit and brings the fuses up in safe, convenient reach. The fuses can then be quickly inspected or replaced.

Hi-Fuse Control with the SA-FUSE Compartment is an economical, highly protective control. It is the kind of modern motor control you will want in your plant because it is a forward step in providing security from high voltage hazards. The E-M Sales Engineer near you will be glad to give you complete information.

Be sure to write for E-M Bulletin No. 211 and E-M Foto-Facts No. 21, which show step-by-step illustrations of SA-FUSE operation.

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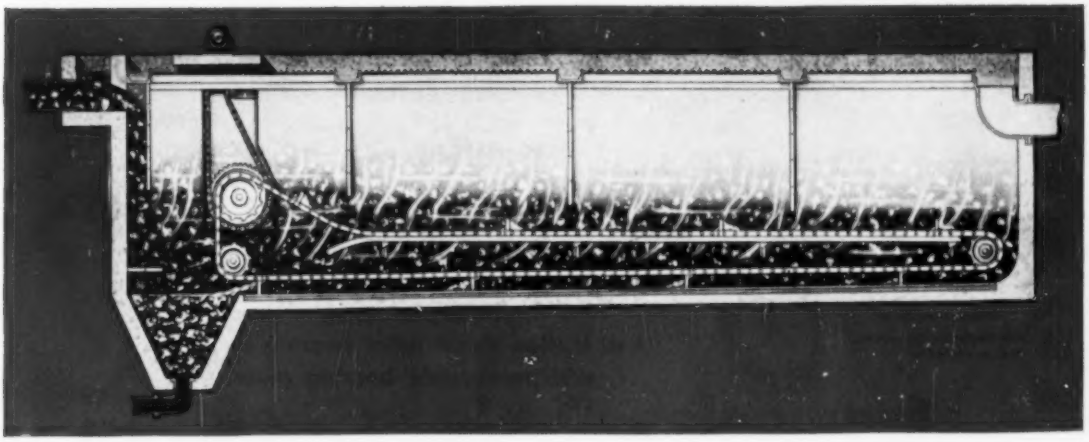
## increased tank capacity?
## clearer effluent?



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**only verti-flo gives you all these advantages**

**Detention Periods 25% to 50% Shorter**
**Maximum Clarity of Effluent**
**Utilizes Full Tank Volume by Eliminating Short Circuiting**
**Completely Adaptable for Varying Rates of Flow**
**Provides Flexibility in Flow Distribution**
**Allows Sludge Recirculation**

***Can be installed in existing basins with minimum structural alteration . . . will at least double capacity and improve results***

For efficient settling tank operation, more and more engineers are turning to Rex® Verti-Flo®. Here's why—Verti-Flo divides the tank into separate and distinct cells through the use of special troughing weirs and baffles. The solids-bearing liquid is introduced into each cell *at the bottom* along a specific zone. The liquid moves upward—or diagonally upward—gently through the individual cells. The result: improved hydraulic efficiency, which assures a clearer effluent in considerably shorter detention time. Short circuiting is eliminated so that full tank volume is used. Capacity from a Verti-Flo tank is 200% to 400% greater than that of a conventional tank.

**For all the facts write for our new Verti-Flo Bulletin. Chain Belt Company, 4610 W. Greenfield Ave., Milwaukee 1, Wis.**

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For bulk water deliveries at periodic or continuous high rate of flow.

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### ADDITIONAL DISC METER FEATURES

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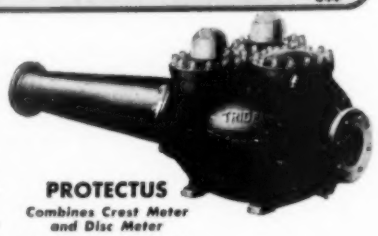
For large services with occasional small flows. Accurate over a wide range.



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For fire service lines. Low loss of head. High accuracy.

WATER & SEWAGE WORKS

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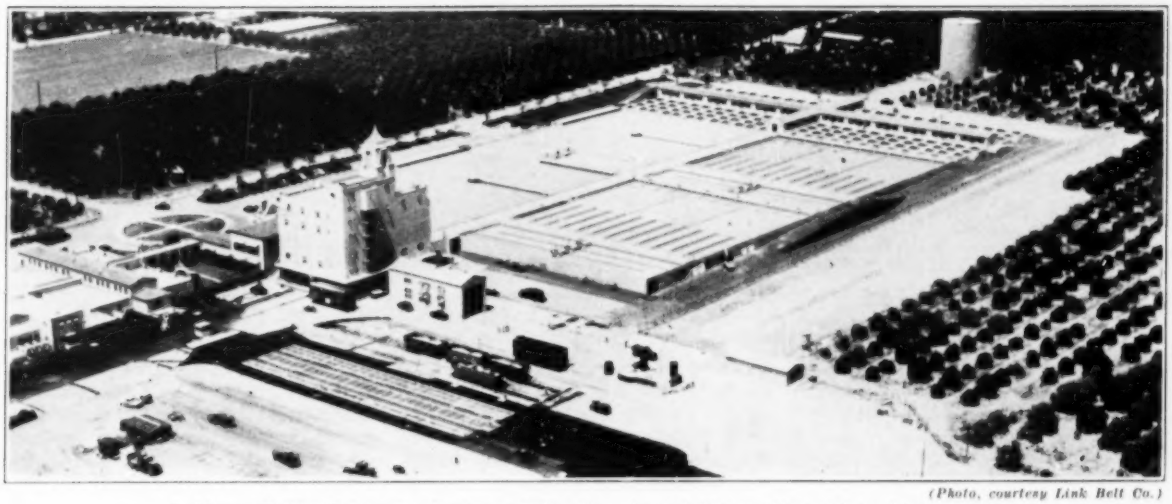


*(Photo, courtesy Link Belt Co.)*

LaVerne, Calif.—Enlarged softening and filtration plant of Metro. Water Dist. of Sou. Calif.

# Water Supply Developments During the Year 1952

## A Review of the Year's Progress and Trends

*by* CHARLES H. CAPEN,* *President, American Water Works Assn., Wanaque, New Jersey.*

WHILE not necessarily the most publicized development, certainly one of the most dynamic and intriguing events of 1952 is that of rain-making. This statement does not by any means imply that rain-making is new, or that its success is limited to this particular year. The significance lies in the manner in which the efficacy of rain-making has been accepted, in the proof so ably presented to the A.W.W.A. in Kansas City by Dr. Irving P. Krick, and in his prediction that within five or ten years the pattern of rainfall in certain areas may become reasonably stabilized. The method generally used is that of vaporizing silver iodide under a highly organized system of operation covering a vast area.

Dr. Krick points out that this accomplishment is largely a case of increasing the efficiency of nature. As an indication, the amount of moisture precipitated in a heavy storm is estimated at only one-half of one per cent. Rain-making may result in an eventual problem of storage and distribution. A twenty per cent additional rainfall, it is claimed, could make some nations, such as Spain, North Africa, Italy and the Near East, self-sufficient. It is interesting to note that super-cooling methods (as with dry ice) are not considered effective in the tropics.

### Progress in Weather Control

While the dynamic effects of weather control (including rainmaking) have expanded mainly in the last two or three years, various efforts along this line have developed over a period of many years. The earliest and largest efforts were in the direction of applying heat to orchards when cold weather threatened fruit crops. In World War II England dissipated fog over airfields. In 1916, the city of San Diego contracted with a rainmaker.

It was not until 1946 that General Electric discovered the basic principles and conditions necessary for rainmaking, wherein supercooled clouds are changed to ice crystals:

1. Clouds containing water droplets below freezing temperature must be available.
2. Minimum cloud thickness of 3,000 ft. to 5,000 ft. is required.
3. Vertical and horizontal air currents are needed within the cloud to carry water from surrounding air.

Ice crystals grow rapidly in a cloud by attracting to themselves small

*Chief Engr., North Jersey Water Supply Comm., Wanaque, N.J.

**Washington, D.C.—Dalecarlia filtration plant where fluoridation of the Capital's supply started in June, 1952**
*(Baltimore, Md., began fluoride treatment Nov. 26, 1952 after a delay pending court decision.)*

particles of water in that cloud. When the updrafts of air can no longer support ice particles within the cloud, they fall as rain or snow.

In the U.S., 40 per cent of the land area receives an annual rainfall of less than 20 inches, which would be sufficient if it came when needed. Most of the water-deficient area is west of the 100 meridian line. Ten of the eleven states which lie west of that line supported rain projects in 1951. Six states partly west of that line were sites of experiments. Of the remaining 31, only Ohio, New York and Missouri had projects. Arizona, California, Colorado, Massachusetts and Wyoming have adopted legislation designed to claim atmosphere-borne water. In the U. S. Senate, Senator Case (South Dakota) introduced a bill "to create a committee to study and evaluate public and private experiments in weather modification." This was referred to a Committee.

In Illinois, studies of rainfall have been augmented by radar equipment. Erratic results obtained by ordinary methods, because of the lack of sufficient standard gages, may be eliminated because a radar set can scan a 70-mile radius to give quite accurate records. It is said to be equivalent to having a network of gages with one gage for each three square miles. In addition it may be used to study drop size and its effect on erosion.

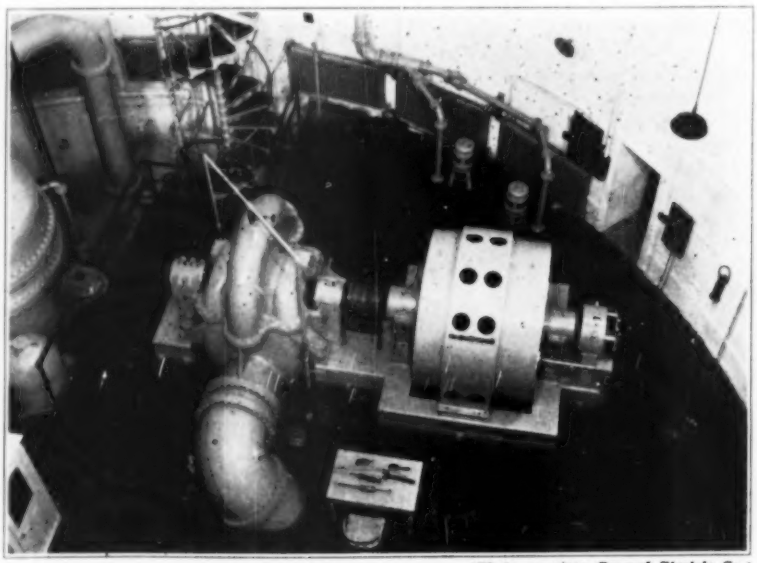
The cost of rain-making operations has also been of interest, and those performing the work are now in competition. It is customary to have contracts signed. In one case, one of the prominent firms in the business obtained a retainer fee of $2,848 and will be paid in proportion to the amount of rain above the all time high median precipitation. In another instance, a flat fee of $8,852 was paid by the ranchers of a county in Wyoming.

An interesting side light to these activities is that of airline pilots who fly through the area in which precipitation activities are in process. They claim that they can frequently see the effects of these efforts, and that stormy weather in some areas in the Southwest has increased markedly since the rain-making began. Detours to avoid storms are more frequent than formerly.

Rain-making has caused at least one water works man to do a little original thinking as to its effect. Mr. Fuller of Batavia, N. Y. advances an interesting theory on the subject, saying that the reduction in cloud intensity or moisture because of far western activities was responsible for the hot, dry weather experienced this year in much of the balance of the country. He urges Federal control of rain-making.

### Water From the Sea

Obtaining water from the sea continues to be an item of study and interest. E. D. Howe, in experiments at the University of California, has tried triple distillation in combination with a Diesel engine power plant. Desalting has been successfully used at a rate of 5.8 gal. per KWH. Solar



*(Photo, courtesy General Electric Co.)*

**Louisville, Ky.—New De Laval pump driven by 2500 hp. G.E. synchronous motor**

*(Designed by E. H. Aldrich. Photo, courtesy Builders-Providence Co.)*

**Novel—10 mgd. filtration plant of the Municipal authority of Westmoreland County, Penna.**

*Each circular unit of 2.6 mgd. capacity comprises an economical combination of flocculation chamber at center feeding annular radial flow clarifier surrounded by 3.5 ft. wide annular filter.*

distillation methods are under study wherein the still serves as a "mouse trap" for sunlight. The resulting yield is 4 gal. per square foot of glass, at a cost of $4 per square foot for construction. Compared to this is a construction cost of $0.50 for the distillation and Diesel power method, and $1.00 for the temperature—differential and power method. Professor Langlier pointed out that chemists are more optimistic than are engineers regarding potentials of salt water as a potable supply.

### Government vs. the Public?

One of the most spectacular developments in the field of water rights has occurred in the Fallbrook Public Utility District of southwestern California. There, a group of peaceful small farms, developed over a period of 18 years, had been dependent on the water of the Santa Margarita River. Then came World War II and Camp Pendleton. Military authorities trod roughly on the rights of the valley folk. All semblance of equity was tossed to the winds, and farmers were all engaged in suits by the Federal Government. Congress saw through this thinly veiled attempt at confiscation, and refused funds to carry on the suit. Defiant and bureaucratic bodies in Washington overrode the lack of funds and continued the suit against the people. The question is, "How long can the powers that be demand respect from citizens when they totally disregard the rights of others?"

Just as significant is the case of the so-called "Phantom Dam of Roanoke Rapids." In this case, the Virginia Electric and Power Company was granted a license to construct a dam for hydroelectric development on the Roanoke, as far back as the '20's. When the area began to boom under the impetus of war needs, the plan again was considered. It was not until 1948, however, that V.E.P. Co. again applied to the F.P.C. for permission to build the dam. That was the spark needed to touch off the atomic bomb of water development. In spite of the fact that the Army engineers had previously rendered an adverse report on Federal expenditures in the valley, and in spite of viewpoints expressed in Courts, the Interior Department has assumed a most untenable, arrogant, and "dog in the manger" attitude. Arguments advanced by Interior are so patently imperialistic that we may well wonder whether the iron curtain is becoming a realistic sobriquet that may be applied at home, as well as abroad.

Similar events have occurred elsewhere. The all-wise Interior do-gooders have sought to spend multi-millions to make the people of Arizona the beneficiaries of Federal largess. By irrigating a large potential farm area everyone in the State should benefit, or nearly everyone. One well-known consulting engineer was told rather bluntly that the Interior engineers intended to take over

*(Photo, courtesy Pipe Linings Inc.)*

**Improved method for cement lining pipes in place by Tate Process**

all water supply developments and put him out of business.

It would seem that somewhere a means should be found to work out an equable arrangement whereby the rights of all are observed and respected. Unless this is done, there may gradually be an alignment of Federal agents on one side and all other interests on the other, with the possibility of a long struggle for supremacy. Such an eventuality would cause many of those who fought for freedom in this country to turn over in their graves.

### Evaporation and Irrigation

In Oklahoma various Federal agencies are making a combined study of evaporation at Lake Hefner for the purpose of testing old methods or promulgating new ones for the prediction of evaporation rates in advance of new construction. Tentatively the formula used is $E = .00177\ u\Delta e$

where $E$ = evaporation in inches.
$u$ = average daily wind speed —m.p.h.
$\Delta e$ = vapor pressure difference between water surface and ambient air, in millibars.

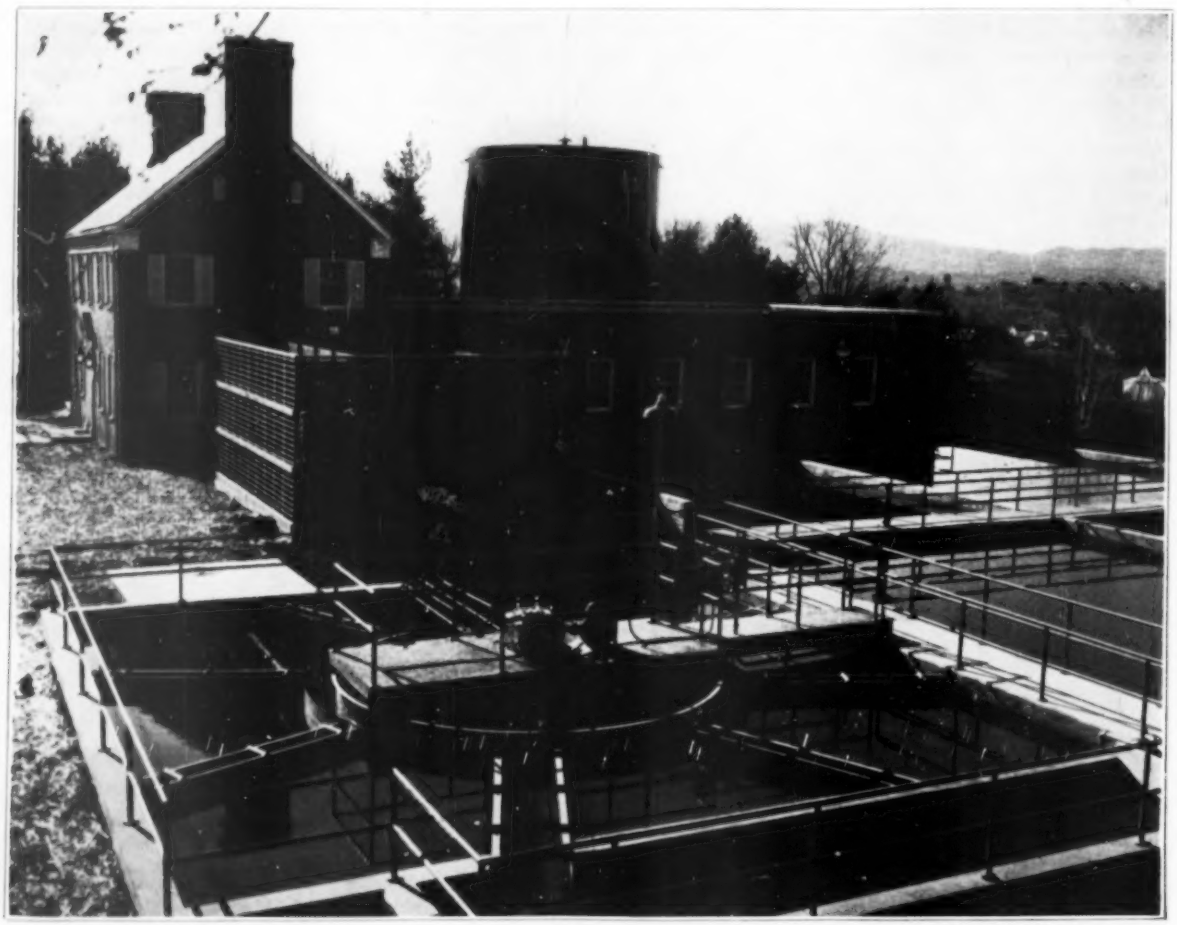
More data is expected on this.

The continuous growth of irrigation projects has not, however, been an unmixed blessing for the water works industry. Oklahoma City has made a series of studies which show conclusively that in semi-arid areas, and where the natural mineral content of the applied irrigation water is high at the start, only one-third of the water returns to the stream. Thus, minerals increase three times while chlorides, in some instances, may increase 13 to 15 times above that in the applied water. It has been indicated that resultant waters on the Rio Grande River may contain 900 parts per million of total hardness and 1,300 to 1,500 parts per million of chlorides. Under such conditions it may easily be understood why the water works men in that area view activities of the Reclamation Bureau with a rather cold eye.

Further use of water from the multi-purpose Colorado River is entailed in the construction of a reservoir for the cities of Big Spring, Odessa and Snyder, with a capacity of 204,000 acre feet. Feeders are the Colorado River and a canal diverting Bull Creek into the reservoir. Supply lines include 105 miles of pipe of 27-inch and 33-inch diameter. Drainage area is 960 square miles, including 380 square miles of Bull Creek area.

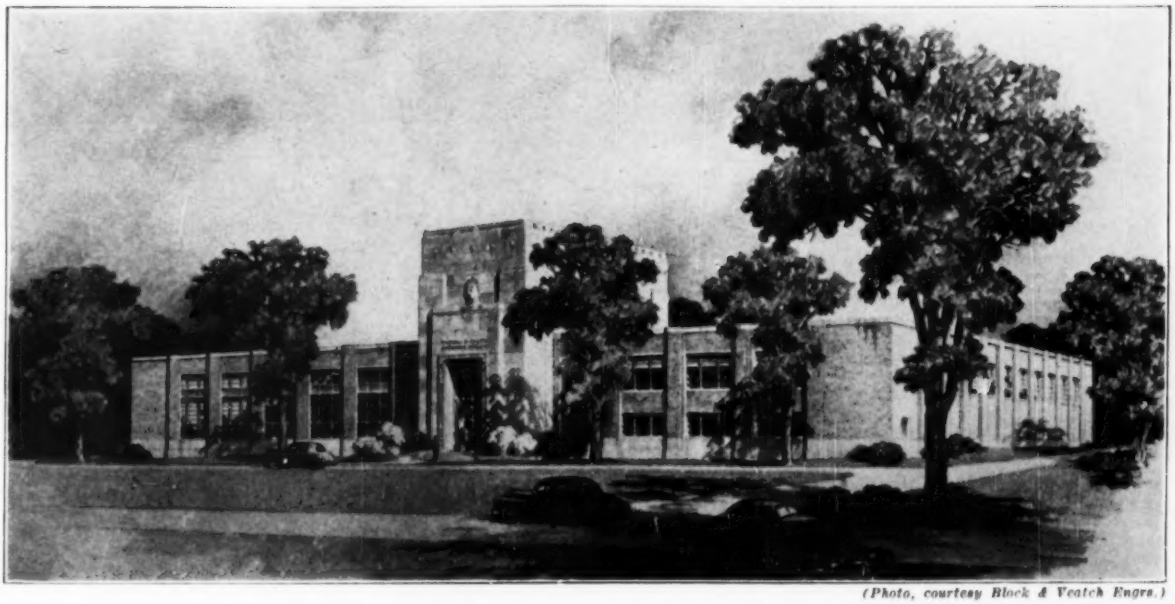
### Municipal Water Needs Increase

The long battle for supremacy between the well proponents and surface water proponents seems to be reaching a point of settlement in Houston, Texas. Said to be the largest city in the world wholly served by wells, Houston is confronted with a water shortage and a new $18.5 million project is now recommended. Population is expected to reach 900,000 by 1965 and daily water consumption to nearly double at that time; an average requirement of 135



*(Photo, courtesy Wiley & Wilson, Engrs.)*

Pulaski, Va.—Town's new dual purpose 3 mgd water softening and filtration plant



*(Photo, courtesy Black & Veatch Engrs.)*

**Memphis, Tenn.—New pumping station and iron removal plant adds 30 mgd to city's supply**

mgd and a peak rate of 300 mgd is estimated.

Growing pains are not limited to the southwest. A 25 mgd filter plant in Eugene, Ore., has been so planned that it can be expanded to 75 mgd in 1953 by the addition of three new filter beds. This plant takes water from the McKenzie River.

Decatur, Ill., is spending $2,075,000 to expand its distribution system for a future population of 68,000.

Chester, Pa., has been driven from use of the heavily polluted Delaware River to a new source on Octoraro Creek, and has purchased the 2.5 billion gallon reservoir of the Octoraro Water Company. The drainage area is capable of delivering 75 mgd if additional storage is provided.

Memphis, Tenn., has found it necessary to add 30 mgd of artesian water to its supply. This is obtained from 15 scattered wells, is aerated in coke trays, filtered, and stored in two 10 mg reservoirs

For the first quarter of 1952 (but actually reflecting the latter part of 1951) N.P.A. approved 935 water and sewage projects in an amount of almost $600 million. New York State stood highest in water projects, a total of $84 million.

### Small Dams or Large?

As an example of outstanding headlines and a startling story, the article in the *Country Gentleman* magazine for May 1952 by Elmer T. Peterson, titled "Big Dam Foolishness" probably receives the water works Oscar. It claims that small retaining dams, soil conservation work, and soil stabilizing crops, are worth much more and cost much less than the lofty multi-purpose dams constructed further downstream.

The same sentiment has been re-echoed by A. H. Carhart who suggests that water management should start at the ridge pole of the watershed. This would include increasing the absorptive value of the soil, contour cultivation, and use of the soil as its own reservoir instead of building lakes that may, in time, silt up. Small upstream dams are recommended and examples are given in the Muskinguin Project (functioning for 20 years) and the West Owl Project in the Washita Basin of Oklahoma. Proof of the effectiveness of the latter is given in the following example: In the spring of 1951, the latter Project received 13 inches of rain in 36 hours, with no resulting floods and no muddy streams. An adjoining watershed suffered a roaring flood, scouring top soil that was carried down to the large Texhoma Dam and reservoir.

### Impounded Supplies

Puerto Rico is making progress in its $26 million water project to convey water collected from four rivers on the rainy north slope through a 31,000 ft. length of tunnel to the south slope. There it will join water from three other reservoirs, developing power in its 1200 ft. drop, and feeding into the Rio Loco Reservoir. Further flow is through 25 miles of irrigation canal. Flood control is also provided, in addition to a 30 mgd supply for San Juan.

An example of state-industrial cooperation is provided whereby Texas has granted a permit to Sandow Co., a subsidiary of Alcoa, to divert 18,000 acre feet per year from Little River during periods of high flow. Water will be impounded behind an earth dam, 50 ft. high and 1.1 mi. long, and will be used principally for operation of a 300,000 k.w. electric generating plant.

Loss of water from canals has always been a vexing problem. Seepage rate from a canal in Nebraska had reached 20 per cent. There are 72 miles of main canal having a capacity of 2500 cfs. Infection of silt into the underlying sand reduced losses, with pumping of a slurry at 125 to 150 psi into holes at 10 foot intervals.

Encroachment of salt water on the underground supplies in the Los Angeles County area of California has caused the Flood Control District to act as the contracting agency for the California State Water Resources Board. It is hoped that ground water levels will be built up by use of injection wells. Investigation of other means to prevent intrusion will be carried out with any balance left of the funds of $750,000 appropriated.

### Trends in Pumping

An example of the trend in large pumping installations is found in the Central Valley Project in California where the Tracy pumping plant, with six pumps, will lift a total of 2,100,000 gallons per minute against a head of 197 feet.

*(Photo, courtesy The Dorr Co.)*

**Hardinsburg, Ky.—Most efficient and economical solution providing modern utilities at lowest possible cost**

*Simultaneous installation of sewage treatment plant (left) and water purification plant (right)*

Pumping costs have been reviewed and pump efficiency improvements, combined with reduced electric power costs, have actually resulted in an over-all reduction in total cost during the past 30 years which is certainly contrary to the general trend.

### Water Rate Controversy

Perhaps no one subject has received more attention at water meetings than the highly controversial one regarding rates to be charged to consumers outside city limits. This, of course, applies only to publicly owned supplies. A few years ago the tendency was to charge as little as 10 per cent and as much as 50 per cent over the city rates. Now the trend is toward higher rates, and a 100 per cent excess is not uncommon. In Tulsa, Oklahoma, an unusual rate is found, consisting of $1.25 for the first 100 cubic feet in any one month, dropping to 45 cents per 100 cubic feet for a second substantial step. Rates outside the city limits are twice this figure.

### Waterworks and Civil Defense

Civil Defense has had a series of successive injections of enthusiasm. Generally speaking, water works men have not taken the situation as seriously as most of those who direct this effort would have them do. A reasonable amount of quiet cooperative effort has been expended, but the movement is neither comprehensive or widespread.

Not many water systems have gone to the trouble that Denver has. The new $11 million dam of this city is to have controls located underground to protect against bombs and freezing. Water from this source supplies both a new atomic energy plant and the City of Denver. Stored water is transmitted through the Moffat Tunnel from the Fraser River. The valve chamber will have 225 ft. of vertical rock cover and 100 ft. of horizontal protection. The additional cost of this protection will be $25,000.

### Continuous Supply Insurance

For the huge Fairless Works of the U. S. Steel Co., Morrisville, Pa., a water supply of 250 mgd has been developed. In order to avoid any full scale shutdown because of lack of water, four insurances are provided: (1) a cellular pumping plant wherein any pump can be moved without interrupting the others; (2) a 13 mg settling tank which provides water storage in case of a power failure; (3) a 60,000 kw steam power plant connected with an independent power company supply; and (4) a pair of steam driven pumps that can draw 70 mgd back through the usual discharge line and deliver it to sustain minimum operation.

Chicago plans to build six miles of water tunnel in conjunction with step 2 of the city's 960 mgd ($85 million) filtration plant construction program. All but 330 feet of tunnel will be in limestone, and the maximum depth below Lake Michigan will be 220 feet.

*(Photo, courtesy Pbg.-Des Moines Steel Co.)*

**Fort Worth, Texas—One of several new elevated tanks**

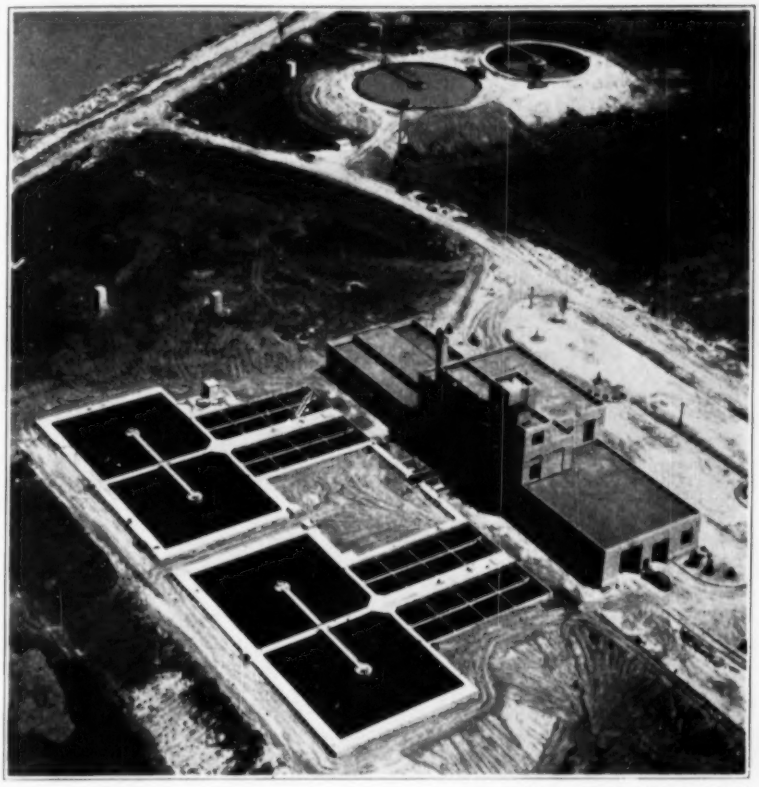
A 20 foot diameter tunnel will deliver raw water to the filtration plant, and a 16 foot tunnel will handle the filtered water.

### Vibratory Explosives

Oil field techniques are attracting the attention of water works men in California. A method has been developed of increasing water yields by setting off a series of discharges through perforations in the side of a specially constructed steel gun body, or on a steel strip. Up to 90 shots can be fired at one time. The individual shots penetrate the well casing and travel a considerable distance into the surrounding soil.

### Large Scale River Projects

River projects of one type or another continue to be an important phase of water usage. The Pacific Gas and Electric Company has spent over $5 million on a hydroelectric development on the Bear and Mokelumne Rivers. $14 million is the figure for the Cherry Creek Dam, a joint project for San Francisco and the Modesto and Turlock irrigation districts. The Mission Bay project in San Diego, a $24 million plan, was 35 per cent complete early in 1952 and is designed to provide a flood channel, harbor improvement and park.



*(Photo, courtesy The Dorr Co.)*

**Council Bluffs, Ia.—Water from the "Big Muddy" Missouri River treated in this new 16 mgd plant has 95 per cent of its turbidity removed by presedimentation**

### Swamp Waters

Flood control of the Everglades is an important topic. It is planned to carry out the work over a 10 year period, to free 2.3 million acres of rich land, and to store ground water for use in dry seasons. Rainfall has been as high as 102 inches annually. There are those, however, who claim that this is not an unmixed blessing. Drainage has caused some of the vegetation, formerly wet, to dry out and then catch on fire and burn. Salt water has moved up the estuaries and invaded fresh water well areas.

### Multi-purpose Dams

In the Columbia River basin 6 or 7 multi-purpose dams are under construction with 1952 appropriations of $111 million. From Grand Coulee River, over 1,000,000 acres are to be irrigated. Six of the world's largest pumps are to be installed, each capable of delivering 720,000 g.p.m.

The total funds appropriated for dams in 1952 is truly amazing and makes one wonder where it is going to end.

### National Water Policy

In the matter of a National Water Policy, various viewpoints regarding the relative merits of the recommendations of the Engineer's Joint Council and those of the President's Water Resources Policy Commission continue to be enunciated. Dr. Abel Wolman summarized the findings of two groups and observed that "Continuing present policies will mean waste of money and effort in the pursuit of conflicting goals." Senator Douglas is quoted as summing up the situation by saying "One can be a liberal without being a wastrel."

### Moving Day—Who Pays?

An item that has been a nightmare to many operating systems, both small and large, has been that of moving water facilities from the path of highways. There is a most decided lack of uniformity in the matter of compensation to water utilities when such moving is required. In some states, the highways bear all the costs, while in others they bear none. In fact, there are two states where it has been ruled illegal for state funds to be used to reimburse any utilities for such costs. Federal authorities claim that payment for moving utility facilities would reduce road mileage by 25 per cent. This figure seems fantastic.

### Where the Water Goes

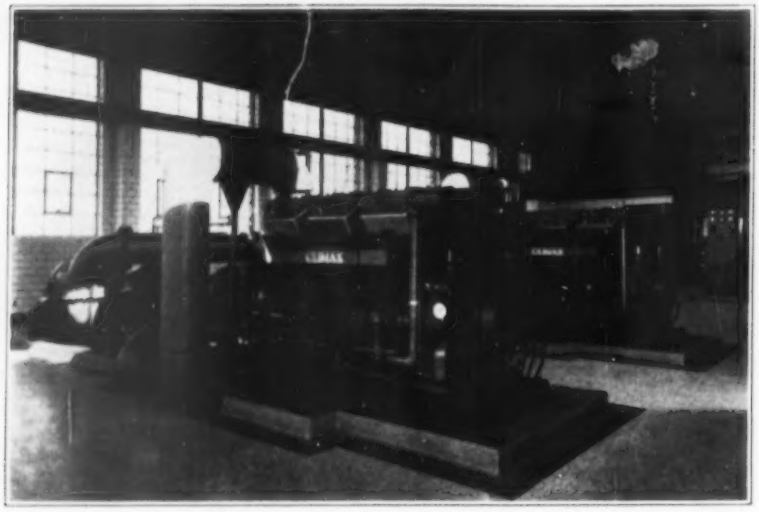
Statistics concerning the quantity of water required to produce certain items continue to be compiled slowly. The following figures have been provided by the NPA.

| Item | Unit | Quantity of Water Used |
|---|---|---|
| Aviation gasoline | 1,000 bbls. | 1,050,000 gals. |
| Synthetic gasoline | 1,000 " | 15,000,000 " |
| Rolled steel | Ton | 80,000 to 110,000 gals. |
| Refined sugar | Ton | 24,000 to 34,000 " |
| Sulfate pulping | Ton | 64,000 to 70,000 " |
| Viscose rayon | Ton | 180,000 to 200,000 gals. |

In reporting on the Natural Resources of Ohio, A. W. Marion gives the amount of water required for the growth of various crops as follows:

| Item | Unit | Tons of Water |
|---|---|---|
| Corn | Bushel | 20 |
| Wheat | " | 20 |
| Soybeans | " | 36 |
| Alfalfa | Ton | 850 |

Annual crops in Ohio require 8 billion tons of water, much of it during July and August when flows are low. Irrigation of greenhouse crops takes more than 3 billion gallons. Ohio rainfall averages 38 inches annually; ⅔ of the volume is used for



Moline, Ill.—Two 12 cylinder Climax gasoline engines direct connected to 6 mgd. high lift centrifugal pumps in Municipal Water Works

crops and ⅓ comprises run-off, mostly during floods. Only one inch is used for the needs of daily living and industry.

### Reservoirs for Recreation

The trend toward making use of public properties, and notably water works properties, for controlled or guided recreation is of increasing interest. One typical form of this is to use the top of a covered distribution reservoir for tennis courts. At Pasadena, Calif., what is said to be the largest covered reservoir in the West has been planned with tennis courts, and perhaps other recreational facilities to follow.

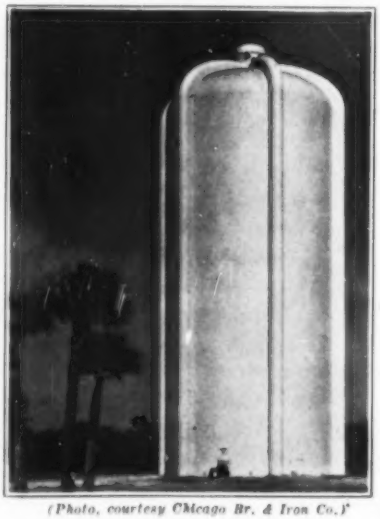
### Pressure: Human and Water

For many years, water works men have been aware of the fact that a broadcast or televised event of special moment creates attention that results in a general diminution of water usage and a corresponding increase in pressure. A headline once appeared in a paper saying, "Joe Louis Beats F.D.R." The meaning of this unusual caption was that water pressures increased more when Joe Louis was fighting than when the late President spoke. This indicated clearly a greater listening audience. As a means of demonstrating a most unusual situation of opposite effect, Marvin Owen of Los Angeles drew attention to the fact that shortly after a recent earthquake in California, which occurred at 4:55 A.M., water pressures were markedly reduced. The reduction was not caused by water breaks or leaks. It was strictly a case of increased water use when people were suddenly awakened by the earthquake.

### Concerning Fluoridation

On May 8, 1952, in regular meeting at Kansas City, the Board of Directors of the A.W.W.A. adopted a policy statement reaffirming its position on the fluoridation of public water supplies as published in the Journal (July 1949), and as reviewed and extended in May, 1951. In October, 1952, the Association published "Willing Water" No. 19, to present up-to-date documented pro and con evidence concerning fluoridation.

This eight-page pamphlet summarized the official procedure approved by the A.W.W.A., the policy of the A.D.A., and of the A.M.A., and the conclusion reported by a special committee of the National Research Council. It cited in detail the report of the Delaney Committee of the House of Representatives (formed to investigate the use of chemicals in food and cosmetics), which reported its findings on fluoridation of public drinking water on July 10, 1952. Other pertinent information included a discussion of natural fluorides and general health; a census of the natural fluoride content of U.S. water supplies; a number of items relating to the practical application of fluorides; and a summary of the results of demonstration installations of fluoridation.



(Photo, courtesy Chicago Br. & Iron Co.)

Clearwater, Fla.—New 1 mg standpipe

The Task Group of the A.W.W.A. reported that, as of January 1, 1952, there were 172 water systems, serving 240 communities and 4.41 million people, adding fluoride to their public supplies.

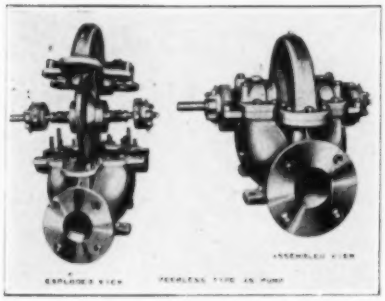
Fluoridation continues to be a topic of interest, debate and speculation. During the year several cities held a referendum on whether or not to fluoridate their respective water supplies. Not all resulted in the same directive. There seems to be an increasing sentiment in favor of the practice by certain groups; sometimes, but not always, inspired by dental or parental societies. Water works men fail to respond, in many instances. One water works man has said, "In five years all of you will be fluoridating your supply—in fifteen years none of you will be." That seems to sum up the situation quite well, indicating that many water operators are certainly not enthusiastic about the process, and that they expect in the next decade or so to see means of conveying desired quantities of fluoride into the human system other than by water.

In the meantime, the battle of the pros and cons regarding fluoridation continues. So far as can be observed, no other controversy has so animated the entire water works field and has caused so much discussion within the memory of most of those in the industry. Perhaps this may all lead to a more intense search for information that will eventually permit an impartial evaluation of the subject.

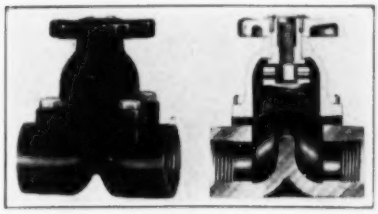
### Epidemic of Main Breaks

Broken mains continue to be the bane of water works operators' existence. Washington, D.C., reported a 36-inch main break; while Wichita, Kan., experienced three breaks in 48-inch mains in 4 days, stopping production in three defense plants. In Binghamton, N.Y., a 20-inch main broke near the pumping station, and all firemen off duty were recalled to their posts. A spectacular break occurred in the 60-inch line outside city limits of Denver, Colo., causing much damage. Leaks were repaired

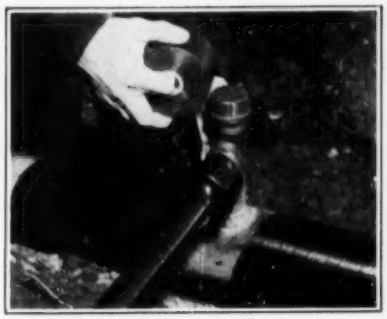
## Some New Equipment Items of 1952



Horizontal split-case general service pumps—Peerless Pump Div., Food Mach. and Chem. Corp.



Plastic all-purpose diaphragm valves—American Hard Rubber Co.



Polyvinyl chloride adhesive pipe tape —Dresser Mfg. Div., Dresser Ind., Inc.

in a 96-inch pressure aqueduct in Winnipeg, Canada, by rendering effective the copper expansion joints which had not been operating satisfactorily.

### Compressed Air Put to Work

Because of the more common use of compressed air in sewage operations it seems likely that the adoption of air conveyance of materials has been more popular in sewage plants than in water plants. The new filter plant of the Indianapolis Water Company represents a somewhat new departure from the commonplace, therefore, in its rather wide use of compressed air for conveying dry chemicals. There is much to be said in favor of such methods.

### Color is Coming

The trend toward artistry in the color scheme of water works structures is becoming increasingly evident. The day when stationary or moving equipment was painted a bright fire engine red appears to be about over. Likewise, the dull drab colors chosen by other extremists seem doomed to pass. This is strikingly demonstrated in the new Tennyson Pumping Station recently completed at Cincinnati, O. There the pumps are painted a chartreuse color. It may sound odd, but with proper blending of color of floor and walls a most pleasing effect has been produced.

Another innovation in this same station is that of an operating table following the pattern of the slanting face control board which has become popular in modern power plant design. This table is set near the center of an arc of panels containing various recording and indicating instruments. (See front cover picture.—Ed.)

### Practical Applications

Practical use of the McIlroy network analyzer calculator has begun in Kansas City, Mo., where two engineering firms have underwritten the installation of one of these impressive machines under suitable auspices so that technically trained men can make the use available to any interested parties.

Diatomaceous earth filters continue to attract users in certain areas. They appear to be particularly useful where intermittent operation may be required.

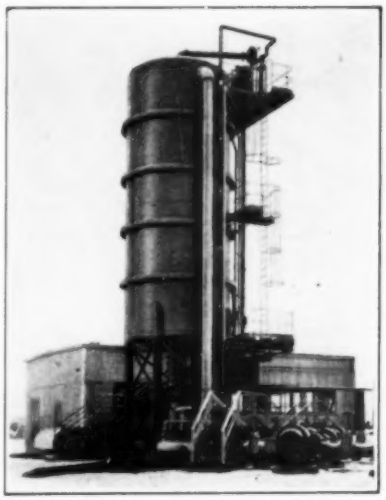
*(Photo, courtesy Am. Well Works, Inc.)*

Columbus, Ind.—New iron removal plant

## Some New Equipment Items of 1952

Pneumatic control system for rapid sand filter plants—Foxboro Co.

Telemark transmits distant liquid levels by phone—Leupold & Stevens Insts.



Vacuum deaerator for reduction of corrosivity of water—Permutit Co.

### Progress in Plastic Pipe

The increasing cost and recent scarcity of certain metals have caused water men to make careful investigations into the use of plastic tubing, particularly for house service connections. Much of the final determination of the usefulness of such materials will depend on observations made during the next few years. As yet, no one particular material seems to meet all the requirements. Generally speaking, it seems to be the attitude of most operators that such materials may be used where no unusual conditions obtain or when other materials are not readily available.

In Pax, West Va., 33,000 feet of 2-inch plastic pipe were laid in acid producing soil, which corrodes metal pipe in three years. The rugged terrain made the flexibility of plastic pipe an important factor in this location.

In California, Socha and Spaulding have carried out extensive studies and have concluded that no entirely satisfactory plastic pipe has yet been developed. On the other hand the Am. Water Works Service Co. in an article by Carns and Flentje (W.&S.W. Nov. '52) report satisfactorily experience, justifying extended use of polyethylene plastic tubing to the 111 water utility properties served by this company.

### Cathodic Protection

Cathodic protection is obtaining many adherents and an example of its value has been cited at Long Beach, Cal., where six tanks installed in 1932 had begun to show deterioration. Cathodic protection was installed in 1945 at a cost of $1,460 per tank and a yearly current cost of $26 per tank.

Magnesium anodes for cathodic protection of pipe lines is becoming increasingly recognized as useful in soils ranging in resistance between 100 and 2,000 ohms per cc, and is economical where current requirements are low.

### Unique Dual Purpose Plant

Pulaski, Va., has a unique dual purpose municipal water treatment plant that softens hard water and hardens soft water. This treatment is necessitated by the two sources of supply, one hard and one soft. The former has a hardness of 250 to 350 ppm.; the latter less than 10 ppm.

### Water Storage Tank Fails

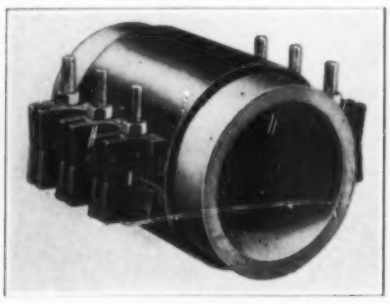
Failure of a 2,300,000 gal. water tank at Tucumcari, N.M., on December 13, 1951, was an unfortunate but spectacular event. The tank was 115 feet in diameter and 30 feet high. It was originally designed for oil storage, not complying with A.W.W.A. specifications. First used by the Bureau of Reclamation, it was torn down and reassembled two years later, and stood for 11 years before failing. Its failure resulted in the loss of several lives, destruction of considerable property, and serious impairment of the city's water supply. The failure was said to be attributable to improper welding when re-erected.

### Growing Needs of Population

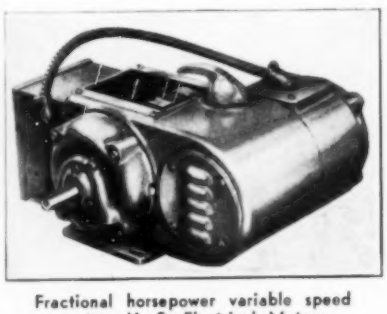
Examples of growing pains in cities are found in many parts of the nation. One example is that of Atlanta, Ga., where expansion has added 82 square miles to the city. A two-stage program, costing $10 mil-

## Some New Equipment Items of 1952

Compact, portable pH meter—Beckman Instruments, Inc.



Wrap-around pipe clamp for permanent pipe repairs—R. H. Baker & Co.



Fractional horsepower variable speed motor—U. S. Electrical Motors

lion, has been set up, the first half to include the replacement of 100 miles of galvanized pipe with 6-inch mains.

### Employee Relations

An example of beginning with good relations at home is now being practiced by the Atlanta Water Works. A recreation building is being erected out of largely discarded materials. Outside walls are Belgian blocks removed from old streets, windows are discarded metal sash, reglazed, kitchen equipment consists of repaired units, and so on. Only the roof is entirely of newly purchased material. It is a building of which any public group might well be proud.

### Invention and New Equipment

In the field of research and invention, 1952 has not lagged. Among many others, the following developments are noted:

A tapping sleeve having a stuffing box type of joint, by which tight joints can be obtained without stressing flanges or bolts.

A sanitary packing for bell and spigot joints that will not support bacterial growth.

Plastic tanks for hydrofluosilic acid, and a seal-less centrifugal pump for chemicals, with magnetically driven rotor impeller as the only moving part, having no seal and no stuffing box. The rotor is plated and is especially useful for handling corrosive liquids. Available in 1, 2 and 3 HP sizes.

Packaged chemical feed unit to deliver liquids under pressure. Self contained, with a chemical proportioning pump and 50 to 100-gal. capacity.

Simple testing procedure (patented) for determining the hardness of water by titration, using a colorimetric indicator.

Plastic reservoir, designed for filling a burette by squeezing the reservoir.

Dual valve with a small bevelled vane mounted in the center of a large vane. Designed for a high pressure drop and small volume or a low pressure drop and large volume.

Anti-corrosion pipe tape to protect pipe from backfill, water, acids or alkalies.

Automatic signaller to indicate end of Zeolite softener run.

Sampler to make periodic tests of water hardness and show green or red light, depending on condition of water. Can also operate valves for automatic softener.

Chlorine tablets, each releasing definite quantities of $Cl_2$, for use in tanks, water tunnels, mains, wells and other specific quantity requirements.

Photoelectric recorder for locating pipe corrosion. Section of pipe 1,500 to 3,000 feet long surveyed at a time. Current drop indicates amount of corrosion.

Radiography process enabling field inspection of partially completed welds while the weld is still hot.

These items by no means complete the list of important inventive contributions during the year. They do indicate the broad field of endeavor which, while making some operations more mechanical and even perhaps more complicated, contributes greatly to the sum total of means by which a better final result can be obtained. This, in the ultimate analysis, is the criterion by which such developments should be judged.

### Attention to Accidents

The high accident rate experienced in water utility operation has had its effect in causing concern as to the need of awakening the industry to its responsibilities. At almost every Section Meeting, nowadays, one or more papers have been read to present methods by which we may all benefit. The lesson should be seriously taken by all.

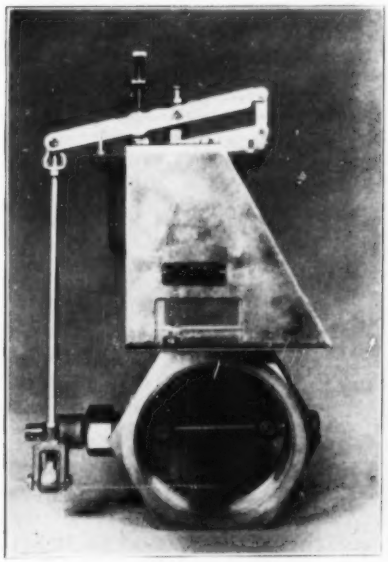
### Water Supply and Public Health

All of us in the water supply business recognize the role that water treatment has played in reducing death rates. Speaking at the A.S.C.E. Centennial meeting in Chicago, Harry E. Jordan stated that more than three million lives have been saved in the last 30 years, as a result of reduction in waterborne diseases.

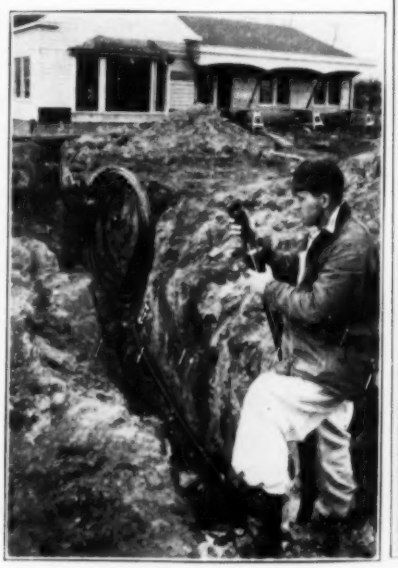
### Hail and Farewell

On the whole, 1952 has not been a year of sideline sitting, as might have been expected in view of NPA controls and the overall effects of the Korean War. Rather it has been a year replete with developments, some dynamic, some unusual, and some commonplace. It will leave its mark as one of more than average interest and accomplishment in the water works field.

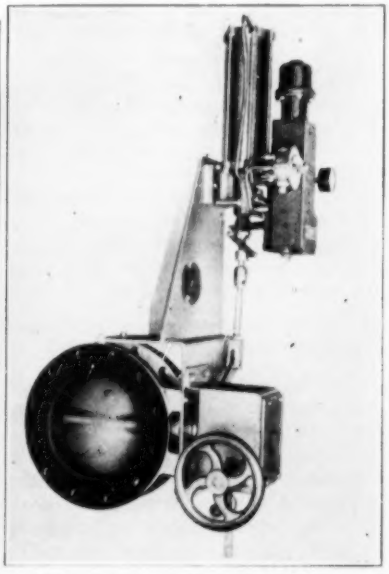
## Some New Equipment Items of 1952



Air-operated butterfly valve—
Minneapolis-Honeywell Regulator Co.



Plastic pipe for water services—
Carlon Products Corp.



High pressure rubber lined valve—
W. S. Rockwell Co.

# Todays Management Problems in Water Supply

## Timing and Sound Rate Structures Prime Considerations in Good Management

*by* LOUIS R. HOWSON, *Alvord, Burdick & Howson, Engr's. Chicago, Illinois.*

MANAGEMENT in the abstract implies control or mastery.

As applied to water works, good management is evidenced by the superiority of capacity over requirements; by revenues adequate to provide good service and finance expansion *in advance of need;* by the derivation of total revenue requirements through equitable allocation of charges to those using the service; and, by the general satisfaction of the users.

One of the prime attributes of management is timing. Good management anticipates rather than follows needs. Any water works that has not provided for future needs is habitually unable to meet the needs as they mature, whether they be physical or financial.

Management problems are of many types, including such as:

(1) Being alert to the requirements for service, present and future.

(2) Interpreting the service requirements in terms of facilities.

(3) Seeing to it that the facilities are available when needed.

(4) Carrying forward ordinary operations with economy and satisfaction to the consumers.

(5) Anticipating the necessity for replacing property and making financial arrangements therefor. (Since it is facilities that furnish service it is the author's belief that it is property rather than dollars that must be taken care of through the depreciation reserve.)

(6) Raising of the funds necessary to provide for the orderly expansion of the property to meet the growing needs.

(7) Seeing to it that revenues are adequate to support the propery and its services.

It is believed that the greatest single responsibility of management is to see to it that its earnings are sufficient to enable it to supply the best service. Since the cost of water service in the average American home is less than 1½¢ per capita per day the difference in cost between excellent and mediocre water service rarely exceeds a fraction of a cent per capita per day.

### Coordination of Management Activities

Good management therefore forecasts its requirements for service, formulates a sound, well distributed construction program, a sound financial policy, economical administration of operations and the equitable allocation of revenues through the medium of fair rates, all coordinated so as to effect a unified interrelated procedure. Each of these steps involves problems of its own.

### The Construction Program

The normal American Water Works is a growing institution. The population which it serves is growing at the rate of about 35% per decade. In addition, water requirements on the per capita basis are usually increasing at a still faster rate.

This paper was presented by Mr. Howson before the Illinois Short Course on Water Works Management, held under joint sponsorship of the Univ. of Illinois and the Am. Water Works Association, Nov. 19, 1952. It is here printed by permission of the author and approval of the sponsors.

The cost of supplying water works facilities over the past three decades has increased at least two and one-half times as fast as the population. In 1907 the U. S. Census report showed the average book cost of water works at about $30 per capita. Forty years later (1947) this figure was approximately $75 per capita. Recent cost of reproduction estimates of nearly 20 water plants show an average of 195% of the original costs, i.e., the cost of reproducing the average water works in 1952 would be about $150 per capita, or five times what it was 45 years ago and double what it was only 5 years ago.

As all construction of new facilities must be in the future, provision for financing must likewise be at future costs. Experience which followed the Civil War, World War I and World War II augurs the belief that construction costs will never again be as much as 25% below those of today —1952. The Engineering News Record Construction Cost Index now stands (Oct. 1952) at 588.48 based on 1913=100. Cost of reproduction estimates indicate that water works construction reflects about 85% of the increase in the general construction cost index.

It is part of good management for every water works, large or small, to have its future water requirements studied and its construction programmed and periodically reviewed for at least a decade in advance. If this is done it will be practicable to so coordinate construction and financing as to make both much simpler and more economical.

Only by advance study and planning can inadequacies, with resultant consumer dissatisfaction, be avoided.

The development of a well considered construction program usually accomplishes the following:

(1) It provides the funds required for construction when needed and not before. In this way it saves the fixed charges on expenditures which otherwise might be made before they are necessary and obviates the inadequacies in service resulting from delays in building large expansion programs.

(2) Construction and expenditures are made as uniform as practicable. Smaller expenditures for construction are made each year which is preferable to accumulated deficiencies corrected at infrequent intervals.

(3) The development of such a program minimizes future obsolescence in that each year's construction in addition to being designed to serve the immediate needs is so planned as to best fit in with ultimate requirements.

### Financial Policies— Municipal vs. Private Plants

Many of the problems of water works management are independent of ownership, that is, whether public or private. Others, such as means of financing growth requirements and establishment of rates for service within and without the city limits, are quite different as between publicly

and privately owned water plants.

For illustration, private water works are ordinarily financed approximately two-thirds by funded debt and one-third by funds derived from the sale of stock or other equity money. The rates must be adequate to attract the necessary capital from both sources. Practically all private water companies are under the jurisdiction of public utility commissions which operate under statutes, which in general prescribe that rates shall be sufficient to yield a fair return upon the fair value of the property. This general rule has in recent years been superseded in some states including Illinois, by a "cost of money" basis. In applying this basis the original cost of the property is reduced by the net credit balance in the depreciation reserve, the funded debt deducted and the balance taken as representing the equity interest in the property. Upon this equity interest a rate of return of 10% more or less is considered as necessary to attract capital. Note that on this basis the equity owners get no compensation for the hazard in constructing and operating the two-thirds of the property represented by debt, and that the rate base gives no consideration to inflation or the decreased purchasing power of the dollar or the reproduction cost or fair value of the property.

The continued application of this procedure in the author's opinion will seriously impair the financial credit of the water companies and their ability to provide the facilities which the consumers should have and thus t! : service will deteriorate. There is l lieved to be no justification for differentiating between the basis of valuing water works property and other properties with which the water works is competing for its financial requirements. "Fair value" fluctuates with the purchasing value of the dollar whether that dollar be expended in water works or in an office building. Since it is a responsibility of management to provide capital for expansion it follows that it is also its duty to see that earnings are adequate and properly determined in order that continuity of funds is assured.

### Financing the Municipal Plant Simpler

Municipalities on the other hand operate under somewhat different conditions. Some municipalities which have owned their water systems for long periods and have wisely managed them are either debt free or have small indebtedness. It is believed that the revenues of a municipal water works so financially situated should consist essentially of the sum of the requirements for operating and maintenance expenses, depreciation reserve, and the average annual needs for additions and betterments. This sum constitutes the amount to be collected from consumers within the city who are in effect the stockholders in the municipal plant.

It is believed the situation is materially different for service supplied by municipal plants to consumers located outside the city. Service to such outside consumers it is believed should be *strictly on a utility basis.* These consumers should pay rates adequate to yield a fair return on the fair value of the property. Under these assumptions the inside consumers get their water substantially at cost, whereas the outside consumers pay higher rates so as to yield a fair return on the value of the facilities provided and paid for by others—namely, the above referred to "stockholders." In two recent instances, in which inside and outside rates were figured on such a "fair return" basis, the outside rates came to about 175% of those currently in force inside the municipality.

### "Pay-as-you-go" Basis the Most Desirable

Municipal plants should develop a sound financial policy designed to eventually retire indebtedness and get on a "pay as you go basis." When this result is accomplished the revenues collected through water sales should be sufficient to pay operating, maintenance and replacement expenses, plus an amount sufficient to cover ordinary additions to the water works, such as distribution system extensions and meters, and an additional amount to cover the average annual requirement for major additions. The latter should be distributed and funds to cover costs should be impounded during the periods between such major additions.

Such a policy, considered over a long term, will result in the cost of water works expansion being approximately 40% less than it would be under debt financing. Costs are thereby amortized as incurred without interest charges.

Financing municipal plants from revenues has the following advantages:

(1) It provides new construction when needed without resorting to expensive bond issues.

(2) It avoids possible delays incident to voting on bond issues and legalistic procedures.

(3) It avoids the political exigencies which arise when bond issues are presented.

(4) When such a financial program is properly developed in connection with a comprehensive construction program the bulges in fixed charges incident to bond issues are avoided.

(5) The consumer's attention is focused upon service rather than cost. When bond issues are presented costs become the focal consideration.

(6) Financing new construction from impounded revenues confines to the publicly owned water utility the control of its ability to finance, construct and maintain high quality service, and assures circumvention of political interference and domination.

Good management does not just happen. It is created. Conferences and meetings in which mutual problems are discussed, and experiences exchanged, contribute toward better management. The better the management the fewer the problems that repeat. Anticipation is superior to correction. The key to good management is adequate planning, coordination and timely execution of construction, financing and operating procedures in such manner as to merit the approval and win the approbation of water users and, in turn, the public-at-large.

## Westchester Water System Appoints Straub Supt.

George Straub of Larchmont, N.Y., has been appointed superintendent of Westchester Joint Water Works No. 1 by the directors of the Mamaroneck-Harrison water company to replace William E. Thrasher, who died recently.

Mr. Straub, a graduate of Stevens Institute of Technology, has been assistant superintendent of the water works since 1950.

## Retirement of Corey, Portland Engineer

R. H. Corey, Consulting Engineer of Portland, Ore., has announced his retirement from active practice. He has maintained offices in Portland since 1930, and during recent years was engaged largely in the field of municipal water and sewage works in the states of Oregon and Washington.

Mr. Corey's practice has been taken over by Clark & Groff, Engineers, Salem, Ore.

FILTRATION PLANT of The Springs Cotton Mills, Fort Mills, S.C.

# An Operator's Viewpoint on Water Fluoridation*

*by* J. D. LESSLIE, *Supt. Filter Plants, The Springs Cotton Mills Fort Mills, S.C.*

FLUORIDATION treatment has been installed in the 1.5 mgd water filtration plant owned and operated by The Springs Cotton mills. The pumping station which supplies raw water is located on the Catawba River, some three miles from the filtration plant.

The plant is equipped with two filters, each having a capacity of 750,000 gal. per day. A 30-minute mixing period is provided by a baffle type mixing and coagulating chamber. This step is followed by 6 hours sedimentation prior to filtering. The filters discharge into a 20,000-gallon pump suction well which is connected to a 2.0 mg storage reservoir.

The treatment process consists of pre-chloramine application, coagulation with alum and soda ash (with occasional use of sodium aluminate), fluoridation, sedimentation, filtration, pH correction with soda ash, corrosion control with meta-phosphate, and an additional application of chlorine in the clear-water storage reservoir. Water is metered to the town of Fort Mill. The total population served is approximately 5000.

In discussing an operator's viewpoint on water fluoridation, it will be helpful to briefly outline our fluoridation program from the planning stage through installation, and its operation up to the present time. In this manner problems confronting the operator will be presented.

## Selection and Installation of Feeding Equipment

Permission was granted to fluoridate the Fort Mill Water supply by the South Carolina State Board of Health through its Health Officer, following the written endorsement of the local Lions Club, the Mayor and Town Council, and the consent of all the local physicians and dentists. The first question to arise at this stage was what chemical to use to supply the fluoride ion. At this time the City of Charlotte, N. C. was making a trial run at its filtration plant, using sodium silicofluoride. Experience gained by Dr. Stadt of the Charlotte Health Department and Mr. Phillips, Superintendent of Plants, Charlotte Water Department, was such that they were in a position to recommend that our plant begin the program by using the silicofluoride.

The next consideration was the type of dry chemical feeder to purchase. Several makes of machines were studied and quotations were received from manufacturers. The decision was made on the basis of factors other than price. Our company is in the position of a private corporation furnishing water to a municipality, and has the responsibilities and liabilities thus incurred. Accordingly, it was decided to purchase a machine having, as we saw it, the greatest factor of safety, the most fool-proof operation, and a means of producing a record of the chemical feed. The Omega Gravimetric Fluoridizer purchased is of the loss-in-weight type, and is equipped with an anti-flood device and a dust filter.

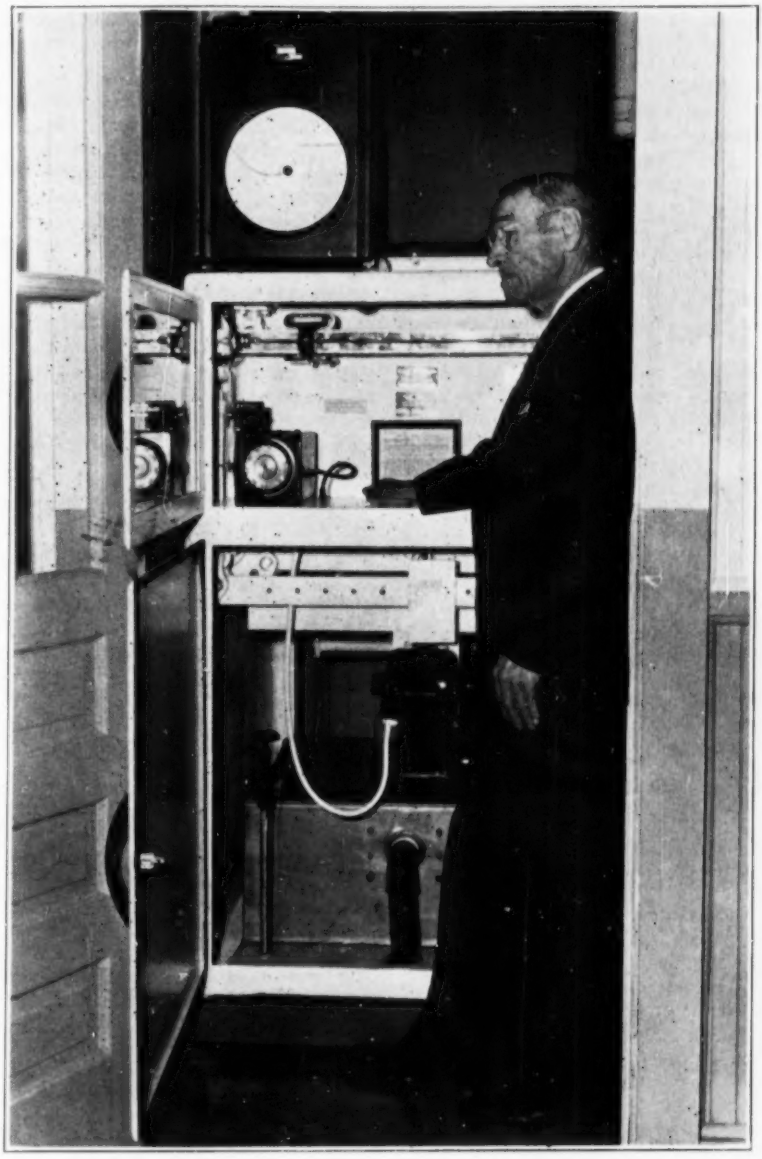
Next to be considered was the location of the feeder and the point of chemical application. It was decided to install the feeder on the floor of the room in which the other dry feed machines are located. A small room 6.5 ft. by 7.5 ft. was enclosed. It has glass windows in the walls and glass panes in the door in order that the operator will have an unobstructed view of the machine from the laboratory and filter floor. This enclosure is sufficiently

*A paper presented at a meeting of the Southeastern Section, A.W.W.A., printed by permission of the Association.

large to accommodate the fluoridizer and as many as ten 100-lb bags of chemical. Thus, the entire stock of silicofluoride is kept in a room separate from the other chemicals. The point of application most convenient to use was the pump suction well, located beneath the pump-room floor and directly below the fluoridizer. The solution line to the point of application is 2-inch Carlon plastic pipe and is proving very satisfactory.

After the feeder had been installed, it was put in operation on May 1, 1951. On hand for the occasion were two members representing the State Board of Health, the mayor of Fort Mill, several physicians and dentists, and the local mill officials. The oldest physician in town was selected to start the machine. Publicity was given this innovation by the local newspapers.

For the first two weeks the machine fed soda ash. This was not explained to those present or to the public. At the end of the period, the soda ash was replaced by sodium silicofluoride without further publicity. There was no reaction of an objectionable nature from any of the consumers either to the soda ash or the fluoride treatment. In fact, there was only one note received in the form of a complaint. It read: "Dear Sir: The stuff you are putting in the water is ruining my kitchen sink. It has already dissolved my false teeth. Can't you do something about it. Signed—A Friend."



START of fluoridation treatment on May 1, 1951
Dr. J. B. Elliott, dean of Fort Mill physicians, at the switch of the Omega gravimetric fluoridizer

### Testing Procedure

During the first four days of operation, tests were made for fluorides every 30 minutes. The Scott-Sanchis method of analyses, as outlined in Standard Methods was used. The samples were collected from the distribution system near the outlet side of the pump which delivers water from the pump suction well. Tests were also made on samples from more distant parts of the distribution system. The dosage set was 1 ppm of fluoride ion.

After the first four days, samples were collected at hourly intervals. This program was continued until October 1, 1951, at which time sampling was reduced to one sample every two hours. In addition distribution system samples are collected daily. There has been no drop in concentration detected between the pump discharge and the end of the distribution system.

### Fluoride Feeding Experience

The results obtained in testing for fluorides during the first month or two gave us some concern. Variations in concentrations ranged from a low of .7 ppm to a high of 1.4 ppm. This was not considered sufficiently uniform for accurate dosing, even though the average of the tests and the weight of chemical applied in a day's time came within .1 ppm of the dosage desired. There appeared fluctuation either in chemical feed or diffusion in the pump suction well. There appeared to be some indications of cycling action in the feed machine. As a means of correcting the condition, both lines of reasoning were explored. The machine manufacturer was requested to furnish a beam counterpoise (with change gears) having one-half the weight of the one originally supplied with the machine. The substitution of this reduced the effective loading capacity of the hopper from 500 to 250 pounds. The change caused the counter-poise to traverse the length of the scale beam in one-half of the time originally required. It was thought the "peaks and troughs" of the curves produced by cycling would be leveled off, in this new manner of operation.

During the same period, the point of fluoride solution application was changed from the pump suction well to the flume between the coagulating and settling basins. Introducing the chemical at this point has not affected the settling of the floc. By means of one or both of these operating

changes, the variation in concentration of fluorides is now only .2 ppm (from a low of 0.9 to a high of 1.1 ppm).

Another problem of fluoride feeding has been encountered. We found two or three bags of silicofluoride in one shipment were very difficult to feed. The material, contrary to expectations, had absorbed moisture. This condition caused the formation of a feeding zone in the hopper, a column about 2 inches in diameter extending vertically through the full depth of chemical. The hopper is equipped with an agitator, but an operator was required to manually agitate the chemical at frequent intervals. The condition was greatly improved by suspending an infra-red lamp in the hopper to dry the chemical.

Another precaution was taken in connection with the fluoridation program. The local ice manufacturer was advised to pump out the cores on each block of ice, an operation he had not done in a consistent manner prior to that time. As a means of impressing him with the need for doing this, a sample taken from one of the cores was tested and found to contain 8 ppm fluorides. The cracking of ice, as experienced by ice manufacturers in Charlotte, has not occurred in Fort Mill.

### Cost of Treatment

The delivered price of our last shipment of 1000 lbs. of sodium silicofluoride was $9.42 cwt. The dosage of 1 ppm fluoride ion requires approximately 13.74 lbs. per million gallons of water treated. Therefore, the chemical cost amounts to $1.29 cents per million gallons. Serving a population of around 5000, the cost per capita is approximately 8.5 cents per year.

### The Operator's Viewpoint

In relating our experience to an operator's viewpoint on water fluoridation, we will discuss certain problems which are peculiar to this treatment process.

First, we would emphasize the responsibility involved in the proper application of a chemical classed as a poison. We think too much emphasis cannot be placed on this characteristic by the supervisor when cautioning the operators, both as to proper handling methods and proper attention to the dosage applied. Some plants, such as ours, have a constant raw water flow into the plant. This reduces to a great extent the adjustments necessary in proper dosing. The operators are provided with dust masks and rubber gloves to be used while filling the hopper.

There are certain operating features of almost any machine which can cause overdosing. These points should be carefully explained to and thoroughly understood by each operator. An occasional reminder either written or oral will keep the operator's attention focused on these points. As an illustration, the need for a reminder came to our attention in the first month of operation.

Our feed machine is of a type that will sound an alarm on either under or over-dosing. In the filling operation the beam is locked in a neutral position. After the hopper was filled, through some oversight on the operator's part, only one lock was readjusted. This placed the machine in the position of "calling for feed" but being able to supply only part of the demand. Our dosage is so low, however, that the feed was more than necessary. This condition was maintained for about two hours until the results of tests revealed an over-dose. Fortunately this over-dose amounted to only 0.6 ppm.

This brings up the point of the number of tests to require in the plant.

From May 16, 1951, through March 1, 1952, some 2470 tests for fluorides were made in our plant. In discussing this with our operators, fluoride testing was given as the only time consuming problem in connection with the treatment process. However, testing has not reached the point of becoming a burden, or of causing a neglect in other work. We will be interested to hear what others are doing in this connection.

We have established a rule that requires the operator on duty to stay at the filtration plant at all times while the plant is in operation. This is a good practice to follow in any plant. In the past our operators have been permitted to leave the filtration plant and visit the mill for a few minutes, once or twice a day.

Our feeder is equipped with several electric switches, one for lights and alarm, one for feed mechanism, and one for moving the counter-poise along the weighing beam and operating totalizer. These several switches provided opportunity for mistakes. A master switch now has been installed outside the machine cabinet. As a result, the door to the controls need be opened only in order to make adjustment in feed.

### Conclusion

In conclusion, we suggest that an operator's viewpoint on a water fluoridation program may be summed up as follows:

The operator recognizes his responsibility to the public.

He uses utmost care in dosing.

He recognizes the value of analyses.

He practices care in handling fluorides.

He is alert to improve uniformity of feed.

He is proud to have a part in providing an additional service to his customers

## Chlorine Order M-31 Revoked by NPA

Chlorine delivery provisions and percentage ceilings on marketable production were eliminated as of Nov. 18, 1952, by the National Production Authority, Department of Commerce.

The action was taken through revocation of M-31, the chlorine order. The order was issued Jan. 23, 1951, to assure chlorine supplies for public health needs and to provide for equitable distribution of defense-rated orders among chlorine producers.

Revocation of M-31 was made possible because for the past six months the supply of chlorine has been adequate to meet the demand, said Thomas C. Keeling, Jr., director of the Chemical Division.

Due to its hazardous nature, chlorine is not adaptable to quantity storage and, therefore, production is virtually equivalent with demand. Production presently is less than rated capacity, according to available data.

At present there is no indication of an increase in military demand which could not be met by existing or expanded chlorine production. The current Do-rated order load is far below the 10 per cent ceiling provided in M-31, Mr. Keeling said.

## Karlinski Becomes Buffalo's Director of Water

Theodore H. Karlinski is the new Director of Water for Buffalo, N.Y., succeeding the late John J. Kennedy.

Mr. Karlinski, who is 45 years old, has been connected with the Water Division of Buffalo since 1939 when he was employed as an inspector. He served in World War II with the Air Forces in a technical capacity at Wright Field, Dayton, Ohio.

# New Jersey A.W.W.A. Section Meets in Atlantic City

## Registration is 311 at Fall Meeting

THE sunny autumn weather and the well planned program contributed to a highly successful meeting of the New Jersey A.W.W.A. Section at Atlantic City, October 23-25, 1952. The registration totaled 311 (with 226 men and 85 ladies).

Special events included a breakfast for past chairmen and trustees, a ladies get-together and luncheon. The annual banquet, attended by 225, was followed by an old fashioned square dance. Sixty-five members were present at the operators' breakfast and round table discussion held on the last morning of the meeting.

**Chairmen**

**Retiring**
*E. A. Bell*
*Superintendent*
*Water Dept.*
*Essex Fells*

**Incoming**
*C. J. Alfke*
*Exec. Vice-Pres.*
*Hackensack Water Co.*
*Weehawken*

### New Officers

New officers elected to serve for the coming year are:

*Chairman*

C. J. Alfke, Exec. Vice-Pres.
Hackensack Water Co.

*Vice-Chairman*

W. Spencer, Supt.
Merchantville-Pennsauken Water Comm.

*Past Chairman*

E. A. Bell, Water Supt.
Borough of Essex Fells

*Director*

W. G. Banks, Div. Engr.
Newark Dept. of Public Works

*Trustee*

R. R. Stone, Supt. & Engr.
Elizabethtown Water Co.

*Trustee*

C. G. Bourgin, Supt. & Engr.
Montclair Water Bureau

*Secretary-Treasurer*

C. B. Tygert
W & T Co., Inc., Newark

Martin Flentje was chairman of the program committee, and Maurice Brunstein was chairman of the local arrangements committee.

### Fuller Award

George F. Wieghardt, Hackensack Water Co., recipient of the George W. Fuller Award of the New Jersey Section, was cited for his many contributions to the advancement of the Section.

### Technical Program

E. A. Bell, retiring chairman, presided at the first technical session.

### Patent Office Humor

Under the title "30 MINUTES WITH SCREWBALL INVENTIONS," Charles G. Richardson, Vice-Pres., Builders-Providence, Inc., Providence, R.I., displayed a collection of patented devices clearly described by the title of the talk. The peculiar and humorous devices were amusingly discussed by Mr. Richardson, and were illustrated by lantern slides.

### Peddlers' Showcase

Ivan M. Glace, consulting Engr., Harrisburg, Pa., was moderator of a "PEDDLERS' SHOWCASE SESSION" in which four manufacturers' representatives presented technical discussions of water works products. Mr. Glace pointed out the need for such information as a modern operational aid.

### Cathodic Protection

"WATER WORKS EQUIPMENT AND CATHODIC PROTECTION" was discussed by R. J. Walton, Sales Engr., Electro Rust-Proofing Corp., Newark, N.J.

Mr. Walton reviewed briefly the causes of corrosion, a process which he termed nature's reversion of metals by electrochemical reactions to maintain its equilibrium. The corrosion cure particularly emphasized was cathodic protection; in this relatively new application, an externally generated current is successfully used to combat the electrolysis of nature. Installations of cathodic protection are widely found in industrial plants and on oil and gas pipe lines, generally for the protection of external surfaces.

In addition to installations for protection of water storage tanks, cathodic protection devices are used in water works practice on sludge clarifiers and flocculators. At Cincinnati, three years of operation has demonstrated corrosion can be controlled on all submerged metal areas by cathodic protection—at one-half the cost of sandblasting and applying hot enamel, according to Mr. Walton. "Hundreds" of examples of cathodic protection applications in water systems demonstrate the economy of the application.

**Officers**

**Vice-Chmn.**
*W. Spencer*
*Superintendent*
*Water Comm.*
*Merchantville*

**Secy.-Treas.**
*C. B. Tygert*
*Engineer*
*W. & T. Co., Inc.*
*Newark*

In the discussion which followed, Mr. Glace emphasized the importance of proper installation and maintenance. C. H. Capen (Chief Engr., North Jersey Dist. Water Supply Comm., Manaque) said that dependable operation necessitated periodic inspection, and Mr. Walton described the work of service crews which tour the country checking installations and replacing anodes. P. E. Pallo (San. Engr., Hackensack Water Co.) recommended weekly meter readings to assure proper operation of cathodic protection units.

### Radio for Water Works

"TWO-WAY RADIO COMMUNICATION FOR WATER WORKS" was described by Severin Barstad, N.J. Manager, Communication Sales, Motorola, Inc.

Mr. Barstad described several applications of two-way radio equipment in water system operation: for instant communication between the main office and mobile units, repair crews, foremen, and supervisors; to

coordinate operations in emergencies and disasters. The equipment available ranges from 3,000 watt central stations down to the one-quarter watt walkie-talkie unit, and includes 10, 30 and 60 watt mobile units.

Selection is usually determined by the range or coverage required, and important factors are the relative antenna height, the receiver sensitivity, and equipment stability. Communications engineers are specialists and their services should be utilized. At Atlantic City, the three utilities—water, electric, and gas—operate two-way radio equipment.

### Mechanical Joint Pipe

"STANDARDIZED MECHANICAL JOINT PIPE" was described by A. F. Pleibel, Dist. Sales Mgr., R. D. Wood Co., Maplewood, N.J., as first produced in 1942; glands, pipe, and the fittings of various manufacturers are thus made interchangeable. Today about 50 per cent of the pipe produced for water use is the standardized mechanical joint pipe. Advantages cited include: tightness of joints, installation economy, installation simplicity, reduction of bacteria, and serviceability.

"APPLICATION OF MECHANICAL JOINTS TO CUT-IN VALVES, TAPPING AND REPAIR SLEEVES" was discussed by Harry Gaffin, Chief Engr., A. P. Smith Mfg. Co., East Orange, N.J. Mr. Gaffin used lantern slides to illustrate the simple procedure followed in installation of these fittings.

### Ideas for the Future

"NEW HORIZONS" was the title of a discussion presented by P. S. Wilson, Engineer, Glen Ridge, N.J., as a plan for raising the standards of water works systems. These systems he termed generally "starved financially, as a result of penny-pinching policies which reduce efficiency and effectiveness." Water usually is sold at the low rate of 5 to 10 cents per ton.

Informal discussions led to the appointment of an A.W.W.A. committee (P. S. Wilson, L. H. Enslow, and T. L. Amiss) reporting to the Board of Directors and to the General Policy Committee. The committee proposes that funds should be made available and carefully administered to raise water works standards. The project will obviously be a long-term one, but any results are considered to be worthwhile. A public education program must be undertaken and the plan must include both public and private water utilities.

Among the needs already apparent in such a program is a formula by which the efficiency of a water utility may be rated (an enlarged and expanded system similar to that used by the Fire Underwriters). A clearer concept of public relations should lead to willingness to pay an increase of 1 to 2 cents per ton for water. Action must be taken to limit the municipal withdrawal of funds (for other purposes) which the water utility needs.

The A.W.W.A. is certainly the proper body to head a program of this nature, and the need is immediate—not only for physical plant improvements, but because low salaries have meant the loss of capable personnel to industry.

**Director**
*W. G. Banks*
*Div. Engr.*
*Dept. of Public Wks.*
*Newark*

**Trustee**
*C. G. Bourgin*
*Supt. & Engr.*
*Water Bureau*
*Montclair*

Discussion which followed emphasized both recognition of the need for the means to improve standards, and also the complexities of the undertaking. This is the start of a project of basic importance.

### Water Works Safety Program

A 30-min. motion picture, titled "Safe as You Think," was presented through the courtesy of the Public Relations Dept., General Motors Corp. The story effectively demonstrated the importance of observing safe work practices.

"A PRACTICAL WATER WORKS SAFETY PROGRAM" was discussed by G. E. Linn, Manager, Duhernal Water System, Parlin, N.J.

Mr. Linn cited records compiled by the National Safety Council and based on accident frequency per million man hours of work:

33 for water utilities
17 for gas utilities
14 for electric utilities
2 for communications utilities

The higher rate has applied for water utilities since 1937.

Questionnaires have revealed only 41 per cent of water utilities maintain adequate safety programs, and only 10 per cent have safety directors. Of those which do maintain such a program, 81 per cent report it to be effective. The value of a safety program is attested to by a report of an A.W.W.A. task force.

The Duhernal system is a cooperative development of three large industries (DuPont, Hercules, and National Aniline). The water treatment plant is operated by the DuPont Company, and plant employees follow the safety program of the company. In 13 years of operation, the water plant has had not a single "time-losing" accident—and would have experienced 12 such accidents if it had followed the national average for water utilities. Plant size, Mr. Linn explained, has little relation to accident rates (though small business usually has double the average rate).

Examples of safety practices followed in all DuPont plants (of 114 reporting, 75 have perfect records) were described; an estimated 31,000 individual injuries have been prevented by these practices. Early safety ideas have been followed (plant officials live on the plant grounds, and they first operate new equipment), and the training of all employees has proven to be both efficient and economical.

Similar practices can profitably be employed by water utilities. Included would be educational programs, safety booklets, signs labeling hazards, and emphasis on the use of protective equipment for dangerous jobs. Mr. Linn suggested that an A.W.W.A. "safety prize" for accomplishments by water utilities would advance recognition of this important need.

R. A. EDWARDS, Safety Director, Am. Water Works Service Co., Inc., Philadelphia, Pa., in discussing the preceding paper stated that the composite accident rate is 25.12 for all the plants operated by his company. He believes the dangers and hazards in other utilities are so great that this accounts for a greater need for safe practices than in water utilities; there are very few *fatal* accidents in the latter.

His company has operated a safety program for many years under supervision of a consultant safety director, and has employed its own safety director for the past year. The value of its safety program has been demonstrated, and future plans call for even more intensive efforts in this direction.

### How Cold Can It Get?

"TEMPERATURE DEFICIENCY AND FROST PENETRATION STUDIES" were reported by J. G. Carns, Jr., Equipment Engr., and Martin E. Flentje, Research Engr., Am. Water Service Co., Inc., Philadelphia, Pa.

The winters of greatest severity, according to "temperature deficiency" studies, are in this order: 1917-18, 1935-36, 1933-34, and 1947-48. These studies were described as records of the accumulative number of degrees above or below 32 degrees F. Similar data are employed by fuel oil suppliers to keep household fuel tanks filled. Frost penetration studies are based on measurements in excavations. Warning bulletins, based on accumulated data, have proven helpful as guides to preparation for difficult conditions.

### Water Works Research

"RESEARCH IN THE WATER WORKS FIELD" was described by George D. Norcom, Consulting Chemist, Red Bank, N.J., as a real and present need. A tremendous debt is owed to the past; particularly the period 1880-1900, which was an era of pioneering in bacteriology, filtration, etc. Recent accomplishments have come largely from industrial research. A list of needed projects has already been prepared by the Research Committee of the A.W.W.A., but competent personnel is difficult to obtain. Mr. Norcom suggested a research coordinating committee should be a function of the New Jersey section.

P. E. PALLO, Sanitary Engr., Hackensack Water Co., New Milford, N.J., in discussing Mr. Norcom's paper described activities of the A.W.W.A. Research Committee as now devoted to survey and coordination of research underway in the field. The committee will be able to select and define problems, and to determine how the research may be undertaken. Support of all A.W.W.A. members will be needed to advance the work.

### Water Supply for Trenton

"THE NEW WATER TREATMENT WORKS FOR TRENTON, N.J." were described by Lewis W. Klockner, Supt. and Engr., who summarized design and financial aspects. The per-

**Chairmen**

**Program**
*M. E. Flentje*
*Research Engr.*
*Am. Wat. Works Serv.*
*Philadelphia, Pa.*

**Arrangements**
*M. Brunstein*
*Supt. & Engr.*
*Water Dept.*
*Atlantic City, N.J.*

cent consumption of 30 mgd allows only 40 min. for flocculation and 2 hr. for sedimentation prior to filtration. Treatment chemicals include: alum, activated carbon, and chloramine in pre- and post-applications. While the filter backwash rates are inadequate, and the entire plant must be shut down in order to clean the clear water storage units, minor improvements might be adequate except for increasing water needs.

Plans prepared for the new treatment plant provide an initial capacity of 25 mgd (which can be increased to 50 mgd), employing mechanically cleaned intake screens, sedimentation units (4 hr. detention period) with mechanical sludge removal and filters equipped with surface wash. Construction of the new plant was started in May 1952, and at least 18 months will be required for its completion.

About 20,000 consumers are unmetered, but a program has been undertaken to gradually complete meter installations. The rate structure has been reviewed and an overall increase of 20 per cent was applied (with the approval of Township consumers and the Public Service Commission). Future improvements may justify small additional increases—which may be needed to provide additional funds.

### And for Burlington

"BURLINGTON'S IMPROVEMENT PROGRAM" was discussed by Alonzo Shinn, Supt., Water Works. Expansion of industrial developments in the Delaware River Valley (Burlington is only 8 mi. from the new Fairless steel plant) has accounted for increasing water needs for the community.

After detailed plans were approved for a filtration plant, test drillings on an island in the Delaware indicated the availability of water of excellent quality—apparently this is impounded rain water, naturally replenished. The island is about 400 acres in area, the water is drawn from sand at a depth of about 38 feet; two wells have been drilled (they deliver 750 to 840 gpm), and at least two more remain to be drilled.

It is expected that about 5 mgd can be pumped from this source, and a 24-inch pipe line will be constructed. The ground water is to be discharged to the present clear water well for chlorine reaction time. In addition to a new 0.5 mgd elevated storage tank, 6,000 ft. of 16-inch and 10,000 ft. of 12-inch C.I. water mains will be provided. The new island supply and new mains will cost $834,000 (including an auxiliary power generating station), and this supply can be available at least one year before the construction of a new filtration plant would have been completed.

**Programmers**

*C. G. Richardson*
*Vice-Pres.*
*Builders Providence,*
*Providence, R. I.*

*P. S. Wilson*
*Mfrs. Agent*
*Glen Ridge, N.J.*

### Good Water is Not Cheap

"A FINANCIAL MAN'S VIEW OF THE WATER WORKS BUSINESS" was the title of a talk presented by George I. McKelvey, Partner, Darby & Co., Specialists in Municipal Bonds, New York, N.Y. He described the great transition of recent years in the manner of financing municipal bonds. Only GO (general obligation) bonds were known in the early days, and water revenue securities were first termed quasi-municipal bonds. Bond houses were paid a premium for selling water revenue securities (which carried an interest rate ½ per cent lower than GO bonds).

Impetus to the sale of water revenue bonds came with their increased popularity when cities were so much in debt that they no longer had additional taxing power for the GO bonds. As water revenue financing is based on a "sufficient rate" clause, these securities gained in reputation and popularity. Today, the water revenue bonds and the general obligation bonds either are equal in rating or the water revenue bond is slightly higher.

Mr. McKelvey suggested that water, an important commodity, is sold at too low a price—an educational program should be directed toward consumers and rate-making officials. He considers water to be used carelessly (perhaps because it is so cheap), and said low rates do not necessarily benefit consumers.

### A City's Growing Pains

"MEETING TODAY'S PHENOMENAL DEMANDS FOR PUBLIC UTILITY SERVICES" is a problem discussed by J. L. Fitzgerald, City Manager, Clifton, N. J., whose city is located 14 miles from New York, is over 11 sq. mi. in area, has a population of 16,000 and is growing rapidly as a result of

varied local industry. Home developments have expanded continuously since 1945.

Clifton water consumers obtain 60 per cent of their water from the Passaic Valley Water Commission, and 40 per cent from the City of Clifton—which purchases the water it supplies from the same commission! Since 1945, some 4,000 new services have been installed. As the city's water department force is small, land developers have been permitted to install services and systems in accord with local requirements (in accord with specific tests and subject to approval). A bond, and insurance of workmanship for one year, is required. When the city makes installations, the change is at cost plus 15 per cent.

### Panel Discussion of Preparedness

"Disaster Control for New Jersey's Water Supplies" was the title of a panel discussion at which E. Arthur Bell, Water Supt., Essex Fells, N. J., served as moderator. Mr. Bell introduced the discussion by pointing out the need for a *permanent* disaster control organization—not for wartime purposes but to serve at all times. A population needs water for normal living purposes, and fire departments cannot function without a supply of water.

Thomas S. Dignan, Deputy Director, Civilian Defense, State of New Jersey, termed disaster control and civilian defense one and the same thing—but explained that the civilian defense organization does not go into operation until the emergency exists. An effective disaster plan would require the services of men regularly employed in various industries and municipalities. A plan for water supplies, developed by the New Jersey section, could well be coordinated with overall civilian defense emergency plans.

George R. Shanklin, Asst. Chief Engr., Div. of Water Policy & Supply, N. J. Dept. of Conservation and Economic Development, reported his Division to be concerned in emergencies only with the interconnection of systems and the exchange water of approved quality. A joint board, including representatives of five major water systems in Northern New Jersey, has already been created. It is functioning to prepare detailed inventories of equipment, maps of systems, and select competent area control officers. This organization might be extended to function for peace time operations.

Robert S. Shaw, Chief, Bureau of Engineering, State Dept. of Health, noted that the powers of the Health Department are practically unlimited—and that, in the event of an emergency, it becomes an important service agency. Examples were cited of disasters in which the department provided valuable assistance. The Bureau of Public Health Engineering has a staff of 15 men in the Trenton office, and is rapidly being decentralized into district offices. If the New Jersey section undertakes the formation of a disaster organization, the Bureau will be glad to cooperate on mutual problems.

*J. G. Carns, Jr.*
*Eng. Dept.*
*Am. Wat. Works Serv.*
*Philadelphia Pa.*

*G. D. Norcom*
*Cons. Chemist*
*Red Bank, N.J.*

*P. E. Pallo*
*San. Engr.*
*Hackensack Wat. Co.*
*New Milford, N.J.*

*L. W. Klockner*
*Supt. & Engr.*
*Water Dept.*
*Trenton, N.J.*

**Programmers**

Herbert R. Bogardus, Supt. of Engineering, Fire Insurance Rating Organization of New Jersey, differentiated between *usual* and *major* disasters. Fire fighting problems are generally involved in major disasters; any plan for disaster control must involve cooperation with fire fighting services, as integration of public water supplies will be inadequate without mobile pumping equipment.

In open discussion, many members cited both need and willingness to take part in a cooperative organization of water supplies for disaster control.

### Operators' Round Table

C. G. Bourgin, Supt. & Engr., Montclair, presided at the last session—an Operators' Breakfast and Round Table Discussion. Le Roy Evans, Vice-Pres. of Eastern Sales, Mueller Co., acted as leader at the Round Table. Four principal topics were covered in the discussion.

### Fire Insurance Ratings

Herman Bogardus of the Credit Rating Bureau of New Jersey asked for better understanding between the Underwriters and the water purveyors. A certain misunderstanding should be cleared up. There are two organizations: 1. National Board of Fire Underwriters, and 2. Schedule Rating Bureau. Instead of using the term "Required Fire Flow" we should call it the "Desired Fire Flow." This is used as a standard of comparison and as a yard stick for the Grading Schedule. The rates are based on area, the nature of the construction, etc.

William Brush, Editor, Water Works Engineering, New York, N. Y., asked whether Bogardus could tell what the large fire losses were as compared with the small fire losses. Bogardus replied that a large percentage of dollar loss results from a very small percentage of fires. Water departments should be set up to more effectively control large fires. Emergency connections help to reduce insurance rates; it is possible to get a credit for them up to 50 per cent of the overall charge.

Joe Weaver, manager, Penns Grove, asked what is saved by putting water on a fire? He has recently been in South America where water is so precious that it could not be used so lavishly.

In response to questions, Mr. Bogardus said that a water storage tank should be drained and inspected inside about once in five years. It is not necessary to extend fire alarm systems into residential areas since in these areas most alarms are made by telephone. Should Fire Departments be operated by insurance companies rather than municipalities? Mr. Bogardus said that this would be terrifically expensive and paid tribute to the economies effected and the good work done by volunteer firemen. It was brought out that residential areas are not too important but that high value districts are important in preventing high fire losses. For fighting fires over a period of one year, the volume of water required is equal to the normal consumption of a municipality for one-half day.

### Highways and Moving Utilities

In discussing the costs of changing water works property as a result of new highway construction, Sam Newkirk of Elizabeth said all changes in

water distribution systems, that have come about because of change in grade in his area, have been borne by the State Turnpike Authority.

George Weigard of the Hackensack Water Company said that on highways, the Lincoln Tunnel approaches and the Thru-way, the Hackensack Water Company had been reimbursed for whatever work had been necessary.

Laurie Leedom of Newark said that on a highway near Butler the New Jersey State Highway was making reimbursement or doing re-locating work itself for the Newark transmission lines.

It was pointed out that you should make certain that the proper easements are acquired.

C. J. Alfke said that federal, state and local governments should assume all costs of re-location of utilities for road construction. Charlie Capen said that this had not been done in some sections of the country.

### Water and Other Utility Lines

On the subject of gas, oil and other utility lines in well fields and on watersheds, Mike Glace said that at Schuykill Haven the State of Pennsylvania built a four lane road and made complete reimbursement for all changes *outside* the right of way of the public road. Anything *in* the public road the Utility must pay for. He also mentioned the gasoline pipe line near the Sinking Springs Water Company in Pennsylvania which was relocated. Maurice Brunstein spoke of the Naval Air Station on the Atlantic City Watershed and the problems of sewage effluent lines and electric utility lines.

Jack Radcliffe of Elizabeth said that he received a hundred telephone calls regarding the taste of gas in the city water when a diesel exhaust pipe cracked; the exhaust gases were pulled into the air-compressor and were blown into the wells. In one hour, the taste had extended throughout the entire distribution system.

George Shanklin of the New Jersey Water Policy Division said that his division must approve of any structure within the high water mark of any stream to insure that there is no contamination or pollution.

*R. S. Shaw*
*Chief Engr.*
*State Hl. Dept.*
*Trenton, N.J.*

*I. M. Glace*
*Cons. Engr.*
*Glace & Glace*
*Harrisburg, Pa.*

*L. M. Leedom*
*Constr. Engr.*
*Div. of Water*
*Newark, N.J.*

*S. F. Newkirk, Jr.*
*Eng. & Supt.*
*Bd. of Water Comm.*
*Elizabeth, N.J.*

**Programmers**

### Pipe Lines on Bridges

Discussing maintenance of pipe lines on bridges, Laurie Leedom of Newark spoke of an 8-inch line on a bridge across the Lackawanna Railroad. The old cast iron line leaked and a welded steel line was put in. There has been no trouble in ten years. A 26-inch welded steel line across the four main line tracks of the Reading Railroad, in the lower part of Newark, fits into a 24-inch cast iron line which is attached to the bridge with welded arms. The State Highway Department has requested that the arms be riveted to the bridge. Art Simpson, new head of the Newark Division of Water, spoke of the original 48-inch line from the Newark Watershed to Belleville. This line is 50 years old and crosses both the Pompton River and the Pequannoch River. It originally had a wood encasement, which was removed, and after several years' experience there has been no freezing

George Shanklin called attention to the fact that any pipe crossing under, over or along a stream should be approved by the New Jersey Water Policy Division. The bottom of the pipe should be above the under clearance of the bridge; or three to four feet below the grade of the stream bed. Brunstein discussed the experiences with pipe lines underneath the Boardwalk in Atlantic City and the five miles of 48 inch cast iron transmission mains across the meadows. Capen said that expansion and contraction of the two 74 inch steel lines from Wanaque (about three quarters of an inch) was taken care of by tee chambers built into the lines every two miles.

## Cornerstone Laid for New Lawrence Experiment Station

The cornerstone of a new building to house the Lawrence Experiment Station and the Water and Sewage Laboratory of the Division of Sanitary Engineering of the Massachusetts Department of Public Health was laid with fitting ceremony on October 29, 1952, before a large gathering of state and municipal officials and representatives of scientific and research institutions.

The new building for which the Legislature of 1951 appropriated $402,000 is now under construction on Shattuck Street, Lawrence, Mass., on land deeded to the Commonwealth by the city of Lawrence. The new structure is to replace the Lawrence Experiment Station renowned since 1887 for its outstanding contributions to water, sewage, and industrial waste treatment practices.

In addition to providing modern facilities for routine analytical tests and extensive research and experimental work, one of the laboratories in the new building will be used for conducting short courses in water bacteriology and chemistry for the field training of operators of water treatment and sewage disposal plants in the Commonwealth.

## Worthington Foundation Established. Will Aid Science, Schools and Charities

Worthington Corporation has established a "Worthington Fund" which is to be administered by the newly formed Worthington Foundation.

The objectives of the Foundation will be that of "fostering equitable participation in community undertakings in the fourteen cities in which Worthington's plants are located." The Foundation is being wholly financed by Worthington Corporation as evidence that it believes in the principle that "good public relations should begin at home."

### 800 Million for Water & Sewage Works

According to H. E. Jordan, Exec. Secy. of A.W.W.A., estimates based on replies to questionnaire in connection with materials needed under the C.M.P. for water and sewage construction, maintenance and repair during 1952, show that $800,000,000 will probably be spent for such betterments during 1952.

# WATER WORKS PRACTICES

OPERATION • MAINTENANCE • MANAGEMENT

## About the Author, the Course, and an Introduction to Water

### The First of a Series

*by* GEORGE E. SYMONS, *Ph.D., Consultant & Technical Editor, Larchmont, N.Y.*

UPON assignment from the editor of *Water & Sewage Works*, I propose, with the aid of the editors, to present a series of Water Works Short Course Lectures. Each will deal with some phase of the general topic—"Water Works Practices"—and each will be developed from my own notes for a Water Works Short School; and each will be presented to you, the student-reader through the written, instead of the spoken word. If, through the magic of the printer's art, the editor's faith, and the "professor's" style, these lectures will read as though they were being spoken to you, then the experiment will be a success and the task will be a welcome one.

#### About Your Instructor

Neither the subject of "water," nor lecturing on it is new to your lecturer. My earliest recollections take me back to the time that I was six when my play-ground was the water purification plant at Danville, Ill. on the North Fork of the Vermillion River. It was in that same plant that my father had started the operation of the new filters on the very day that I was born. And I had barely started to high school when I took my first job there under his tutelage.

Three years later, I was a full fledged filter plant operator, working the second shift, from two to ten, while going to school part time. Before leaving Danville for college, I had become plant chemist and master mechanic. It was there that I learned to wonder about water and to appreciate the meaning of service and the

WATER—The Highest Gift of God to Man!

feeling that water works men have toward their profession and their work. It was there that I learned of the contrariness of water, of the meaning of a flashy stream, and of the long hours one is often called upon to give, that the consumer might never be without this indispensable commodity—water. It was there, too, that I learned that the very dependability of water supply service and the low charges to the consumer cause him to have no particular respect for its value or for the work of the men charged with providing it.

In college, too, I was "exposed" to water, doing water analysis for the Illinois State Water Survey and I began lecturing on the subject as a graduate assistant at the Unversity of Illinois and later as an instructor at the same place. Some years later, I returned to the professorial lecture platform as Assistant Professor, in night school, at Canisius College in Buffalo, N.Y., where the skeleton work for this series of lectures originated. At the same time I was a Lecturer in Public Health Engineering on the Staff of the University of Buffalo. Although I was engaged in sewage treatment at the time as Chief Chemist of the Buffalo Sewer Authority; it was during this period, too, that I was Chairman of the Erie-Niagara Water Work Operators Conference.

Later as Associate Editor, then Managing Editor of *Water & Sewage Works* I attended more than a hundred water works conventions and short schools over a period of several years. Within the past decade, too, I have had the privilege of editing the 9th Edition of "Standard Methods for the Examination of Water & Sewage" and of acting as Editorial Coordinator of the AWWA "Manual of Water Quality and Treatment." Thus, over four decades, I have been associated with and kept an active interest in water and water works practices.

For a long time, I have wanted to present this set of lectures for which I have been gathering material for many years. Now, that I have been given the opportunity to do so, I hope that you, as a reader of *Water & Sewage Works*, will find this series of "Lectures" both interesting and helpful to you as you advance in proficiency.

### About The Course

This course of lectures will extend over a period of several months. It has been designed to be of interest and aid to: The Small Plant Operator, the New Operator, the Student, and anyone, in the field of water supply and treatment, who may wish to review some of the fundamentals of Water Works Practices.

WATER—Source of Power

The material to be covered in the "course" will range over the entire area of the general subject of water supply and will include material on supply, treatment, operation, maintenance and management. Questions on the part of you—the students-readers, will be welcomed and will be answered at the start of succeeding lectures.

In this series we shall include lectures on history of water supply, hydrologic cycle, source of supply, design criteria, reservoirs, hydraulics, pumping, chemical feeding, coagulation, sedimentation, tastes and odors, aeration, filtration, bacteriology of water, disinfection, chemistry of water, turbidity, color, pH, sampling and analysis, water quality, plant control, fluoridation, corrosion, softening, iron and manganese, maintenance, management, public relations and rates. Other topics may be included as the series develops.

At the end of each lecture topic, names of reference books will be included for collateral reading. Definitions of technical terms will also be given when it seems desirable to do so.—And now, to the first lecture!

The accompanying article is one of a series on the general subject of "Water Works Practices." Each article has been developed by Dr. Symons from his notes for a Water Works Short Course and each is presented in the simple style of a short course lecture. The series has been designed by the author to be of interest and aid to small plant operators, new operators, students, and any who may wish to review the fundamentals of water works practices.—The Editors.

## Introduction to Water

### I—What Is Water?

A. Something More Than $H_2O$

*1. Not a Simple Compound*

a. Contrary to general concepts, water is not simply a compound of two atoms of hydrogen and one of oxygen. Even the purest water is a complex substance, containing many combinations of these atoms, of ions, and of associated molecules, with small amounts of "heavy hydrogen" and "heavy oxygen."

b. It is because water isn't simply $H_2O$, that it behaves as it does; it is a liquid when it might be expected to be a gas at ordinary temperatures; its greatest density is not at its freezing point, but just below; it expands on crystallization (freezing); and, it is almost never pure, because of its ability to dissolve so many materials.

*2. Universal Solvent*

a. The statement, "pure water does not exist in nature" appeared in practically every text published on the subject since the middle of the last century. Because of its peculiar chemical structure and its ability to dissolve almost every element or substance to some degree, it is almost impossible to obtain *pure* water, even in the laboratory where triple dis-

**WATER—Ravager by Floods**
*Kansas City's Plant 17 ft. under water.*

tillation is used. Water is the one universal solvent.

b. In nature, water without some dissolved matter in it, occurs only when water exists as a gas itself. Even in the upper atmosphere, where water may exist as tiny discrete particles, it contains dissolved nitrogen, oxygen, carbon dioxide and other gases from the atmosphere plus very small amounts of microscopic dust particles.

c. When water falls as rain, it "picks up" more gases, dust, smoke, pollen, etc., from the air, but it is still fairly "pure." At the opposite extreme is sea water which contains almost as much salt as it can dissolve plus calcium, magnesium and many other substances including even traces of gold.

d. Because water is never pure in the chemical sense, the term "pure water" is generally used to mean water that is free of both chemical and biological substances which might be either objectionable or harmful to those who drink it.

B. Source of Life

*1. Man Mostly Water*

a. Whether one adheres to the fundamentalist idea of the creation or believes in the theory of evolution, it is impossible to escape the realization that without water, there could have been, and would be, no life at all. No living thing, whether it swim, crawl, fly or walk upright can live without water.

b. Man's own existence begins and is nurtured in a sea within his mother's body and from birth until mortal death, he cannot long endure without that vital substance, water. It is essential to his pulsing heart-beat and his breathing lungs; it cleanses him both inwardly and outwardly; it makes possible his nourishment as a solvent and carrier of food within his body. It is so important that he himself is composed of more than 80 per cent water.

c. The importance of water was realized by the ancients who believed that there were but four elements: air, earth, fire and water.

d. Through a realization of the importance of water to mankind and of its universality in life, one can feel a kinship between water and an Almighty Deity. Thus we find the poet, the philosopher, the engineer and ourselves standing in awe of water as we see it tumble over a cliff, rush through a gorge, or break upon some rocky shore. We may also ponder why this wondrous water (and those who work with it) receives so little regard from those who must depend upon it, not alone for what it will do, but for very life itself.

C. Friend and Foe

*1. Public Servant*

a. Not only is water an element in man's food and an essential to his life, but through provision of public water supply, it has become a great public servant.

b. Water carries away wastes from man's home, it washes his streets, it waters his lawn and garden, it provides him with protection against the ravages of fire, and it makes possible agriculture and the production of foodstuff, both plant and animal.

c. Through the tapping of great falls and the building of huge dams, the energy available from the fall of water has been captured and converted into electrical power to serve industry and community life.

*2. Avenue of Transportation*

a. Water in the rivers, the lakes and the seven seas has provided a "road" of transportation and commerce from time immemorial. A whole volume might well be written on the place of water in the development of the world from the earliest migrations of peoples and the exploration of the earth to modern transportation by magnificent ocean liner.

*3. Handmaiden of Industry*

a. Without water, modern industry not only could not exist, but it never could have been. Water is important to industry not only as a functional part of processes, but also as a means for cooling, cleansing, waste disposal and sometimes as a direct means of handling or moving process material. It is the universal and essential raw-material of industry.

b. This may be the great iron and steel age, but without 20,000 to 25,000 gallons of water no ton of steel could roll out of a modern steel plant. Oil, which energizes transportation on land, on sea and in the air requires some 18,000 gallons to obtain a barrel of "black gold" in the field and another 77,000 gallons of water to transform that barrel into gasoline, lube oils, and a host of petrochemicals.

c. Foodstuffs, like beet sugar, need more than 20,000 gallons of

water for each ton produced. Canning requires up to 25,000 gallons for each 100 cases of canned foods; and, meat packing may use as much as 50,000 gallons of water for every 100 pounds of live animals slaughtered.

d. Clothes, as represented by the textile industry, may use up to 12,000 gallons of water for each 100 pounds of cloth produced. In the realm of chemical industry, the demand for water is likewise extremely high.

*4. Provider of Recreation*

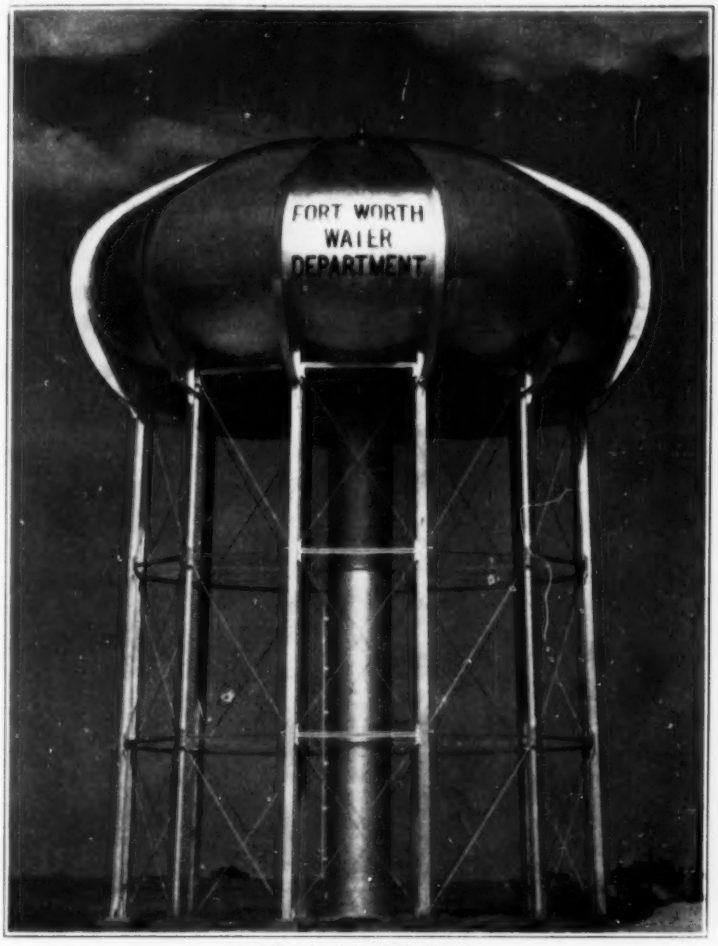
a. Man instinctively turns to water as one of his great sources of recreation. He sails upon its surface, he fishes in its depths, he swims within its liquid confines, he hunts the fowl that nests along its borders, and he disports himself on its beaches. Without water, man's recreational pursuits would be curtailed, indeed.

*5. Ravager of Property*

a. Water controlled within natural or man-made boundaries is a great servant of mankind, but it is savage fury, itself, when lashed by the howling winds and it is rampaging death and destruction when it races madly at flood tide.

b. Floods play a large part in the history of both the ancient and the modern world. The "Great Flood" appears in the Bible, in Chinese legend, and in Indian and Assyrian history. In the latter, the story is quite similar to the Biblical story. Floods of great and small magnitude have been featured in the fiction of many lands.

c. Whether it has been man's lack of conservation practices or the caprice of nature which has caused the swift runoff of falling rain and consequent floods, the facts remains that water, the giver of life, can be the great destroyer of man's handiwork, his homes, his farms, and himself. One need only to have lived through one flood period on a river, or even to have read about it, to appreciate the great power of destruction which resides in moving water.




WATER—Symbol of Civilization.

WATER—At Once a Servant of Mankind and a Thing of Beauty.

d. The floods of 1913 are still fresh in my memory of the midwest, where I watched water works men labor knee deep in water to keep furnace fires going so that the steam engines might continue to supply water to my home town.

I have seen the Ohio River burst its banks to engulf a water plant, which somehow, by virtue of the strong hearted water works operators managed to continue to supply Evansville, Ind.

I have seen the water plant in Kansas City, where on Black Friday, July 13, 1950, the Kaw River, rolling across the state line, put six feet of water over the operating floor of the pumping station, while the "Big Muddy," (Missouri River) threatened to collapse the intake pumping

station as it swirled outside 25 feet above the pump levels.

A year later, I viewed the unbelievable damage of that Kansas City Flood as attested by the grotesque and comical positions of many structures that once had been homes. Interspersed with this desolate destruction was evidence of man's fine disdain for what a swirling torrent can do and his dogged determination to cling to his property "in spite of hell and high water," for here and there were new homes complete with window boxes, flowers and laughing children.

*6. In Summary*

a. These few lines best summarize and serve to introduce, the student to the subject of water and its use.

Highway of trade, handmaid of enterprise
The source of recreation;
A thing of wonderment and oft surprise
And even devastation.
A thing of beauty, of good—a source
And the nourisher of grain,
But for its value and its latent force
Begetter of disdain.
A compound simple, yet so complex:
The universal solvent,
The source of life; it does a man perplex,
But is a public servant.

## II—Glossary

1. *Potable Water*—Water which does not contain objectionable pollution, contamination, minerals, or infection and is satisfactory for domestic purposes.

In the next lecture we shall review the historical development of water works practices from antiquity to modern times.

*Acknowledgement:* All pictures used with this lecture, except that of the Kansas City Plant under flood have been selected from front covers of earlier issues of *W. & S.W.*

# First Illinois Short Course for Water Works Management

A three-day Short Course for Water Works Management was conducted by the Business Management Service of the University of Illinois College of Commerce and Business Administration and the University of Illinois Extension Division on November 19-21. This course was held at Allerton Park, near Monticello, Ill., and was sponsored by the In-service Training Committee of the Illinois Section of the American Water Works Association.

A registration of 42 persons enthusiastically approved of the course which provided 6 speakers from the Univ. of Illinois staff and an equal number from the water works profession.

The course was designed to offer professional training in current management techniques and directed toward executives in the water works industry in Illinois whose management problems are no different from those of other fields of business.

Louis R. Howson, of Alvord, Burdick and Howson Engineers, past president of the American Water Works Association, dealt with financing and management problems of today. W. Victor Weir, President of the St. Louis Water Co. and Missouri Water Co., also a past president of the American Water Works Association, dealt with the importance of unit cost records in cost control as applied to building net revenue.

K. E. Tholin, of the Illinois State Commerce Commission, described accepted practices for accounting, budgeting, records and financial reports. S. C. Casteel, Ass't Manager of the East St. Louis Interurban Water Co., drew from 30 years of experience to detail his impressions of competent supervision and consideration of employees. A panel discussion on public relations both within and without a water works was led by John E. Kleinhenz, Publicity Director of the Indianapolis Water Co. and A. P. Kuranz, Manager of the Waukesha (Wis.) Water Utility.

Members of the University of Illinois staff contributed basic discussions on appraisal of organization management and organization of executive work—job analysis and work simplification—selection and orientation of employees—on-the-job training—and job motivation and incentives, both financial and non-financial.

T. E. Larson, of the Illinois State Water Survey, was Chairman of the sponsoring In-service Training Committee and R. G. Seymour, of the University of Illinois Business Management Service, was the program coordinator.

* Mr. Howson's paper appears in full in this issue; Mr. Weir's paper will be printed in full in our February issue.—Ed.

# Federation's 25th Annual Meeting Held in New York City

## III—Technical Program

THIS is our third and final report of the Silver Anniversary Meeting of the Federation of Sewage and Industrial Waste Association, October 6-9, 1952, in New York City. The first report, in the November, 1952, issue of *Water & Sewage Works* described the highlights of the program, and the first installment of our review of the technical program appeared in the December, 1952, issue.

### Industrial Wastes Session

The technical session held Tuesday afternoon considered important aspects of waste treatment. DR. F. W. MOHLMAN, Director, Div. of Labs., Chicago Sanitary District, presided.*

**Presiding**

*F. W. Mohlman*
*Director*
*Div. of Labs.*
*Chicago San. Dist.*
*Chicago, Ill.*

*Earnest Boyce*
*Chairman*
*Dept. of Civil Eng.*
*Univ. of Mich.*
*Ann Arbor, Mich.*

### Meat Packing Wastes

Packinghouse wastes were the subject of the lead-off paper, with H. O. HALVORSON, Head, Bacteriological Dept., University of Illinois, presenting comprehensive information concerning operating and economic factors. He emphasized the importance of reducing in-plant waste by recovering valuable materials, thus reducing the cost of treatment facilities.

At the Ottumwa, Iowa, packing plant of the Morrell Company, wastes amount to 7 mgd. Since a 5 mgd. volume is cooling water containing no contaminants, 2 mgd. constitutes the volume to be properly treated before discharging. Plant studies located sources of strong wastes and showed that evaporation, plus drying, produced salable solids. The savings of the evaporation process over biological treatment of these strong wastes was graphically illustrated in slides. A five year study was carried out to locate and reduce waste loss in the plant. Illustrations showed striking examples of what can be done when conscientious attention is paid to isolating the wastes from high B.O.D. contributing departments.

In a discussion of the Halvorson paper, M. D. SANDERS, Chem. and San. Engr., Swift and Co., Chicago, Ill., stated that the packing plant rendering department can contribute large quantities of wastes. Slides showed flow diagrams of typical wet and dry rendering processes. Of the two rendering methods, wet rendering contributes wastes highest in B.O.D.

### Milk Processing Wastes

In a paper dealing with the treatment and disposal of milk and dairy wastes, S. I. ZACK, Chief San. Engr., Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa., discussed investigations of 20 milk processing plants in Pennsylvania. The necessity of treating milk processing plant wastes arises from the fact that high waste loads occur during low stream flow periods. Mr. Zack showed slides which demonstrated maximum, minimum and average volumes of milk handled at various plants and flow variations during daily operation.

He pointed out that "good housekeeping" within the plant (reduced spillage) makes a significant contribution to reduced waste volume. Each processing station requires special study in order to determine the most effective way to economically meet standards established by state authorities. Usually, biological processes accomplished the highest B.O.D. removal. Mr. Zack, using slides, showed existing municipal sewer rental charges for various types of milk processing plants.

Although L. F. WARRICK, San. Engr. Director, Tech. Serv. Branch, U.S.P.H.S., did not confine his remarks to Mr. Zack's report, his interesting summary was valuable. He pointed out the importance of reducing wastes at their source, and maintained that much work can be done toward reclaiming valuable by-products. As an example, he mentioned the whey obtained in cheese production, stating that large volumes result daily from processing operations, but that valuable materials remain in the whey after cheese manufacture.

Mr. Warrick discussed milk plant waste treatment investigations, some of which were carried out more than fifty years ago. These investigations contribute not only to lower waste treatment plant costs, but to a lower product cost as well. He described as promising the results of studies in applying the activated sludge process to reduce the B.O.D. and solids of milk plant wastes.

**Presiding**

*R. W. Hess*
*Head, Pollution Res.*
*Aniline Div.,*
*A.C. & D. Corp.*
*Buffalo, N.Y.*

*Henry L. Giles*
*Asst. City Engr.*
*City of Meriden*
*Meriden, Conn.*

### Viscose and Other Wastes

In an excellent discussion of waste recovery and treatment from viscose, rayon and film manufacture, H. L. JACOBS, Engr., Eng. Sew. Div., DuPont Co., pointed out that his company has been forced to study waste conservation in order to profitably market various products. He used slides describing the components of a cellulose viscose and rayon plant.

Caustic soda and sulfuric acid are neutralized in a coagulation basin; discarded viscose and dialyzer wastes contribute to the plant waste load. Finishing oils used in the plant processes and solvents add to the B.O.D. of the waste, as does glucose used to prevent crystallization on spinning machine parts. Hemi-cellulose from the raw pulp results in a B.O.D. contribution, but pulp suppliers assist in solving this problem by providing a pulp low in hemi-cellulose. Nitro-cellulose solvents are reclaimed in an air

* This session was reported by V. W. Langworthy, Res. Chem., The Chlorine Institute, Inc., New York, N.Y.

drying tower where carbon is used as the adsorbent medium. Solvents are extracted from the carbon which is then treated for re-use in the drying tower.

Mr. Jacobs stated that definite improvements have been realized in reducing rather large losses during start-up operations by returning the viscose for re-processing. Cinders and fly-ash are collected at the power houses and removed to the plant dump. Slides showed the steady increase of plant production accompanied by a decrease in wastes. Mr. Jacobs emphasized the importance of educating plant personnel in basic wastes control methods.

C. E. RENN, Prof. of San. Eng., The Johns Hopkins University, in discussing the paper by Mr. Jacobs, described the assimilation capacities of streams receiving viscose wastes bearing sodium sulfate. The light specific gravity wastes, lower when warm, spread out on the water surface immediately on discharge. Upon cooling, the waste mixes with the receiving stream. Professor Renn pointed out the essential need for as precise analytical method for zinc determination, and that definite progress has been made.

### Chemical Plant Wastes

A. J. BURDOIN, Project Engr., Metcalf and Eddy, Boston, Mass., reported on the design and operation of the chemical wastes disposal plant of Pratt and Whitney Aircraft. In operation for a year, the plant treats a variety of wastes, including cooling water, pickle liquor and wash water. Wastes from the plating departments include copper, cadmium, chromates, nickel, silver, lead, tin, zinc and indium. From the stainless steel pickling liquor, hydro-fluoric acid and ferric sulfate must be recovered. Soluble oils from the extensive machining operations as well as lubricating oils from the engine test house require removal.

Slides were used to present views of the plant, and to show oil separation tanks, cyanide treatment tanks, lagoon areas, pumps and piping arrangements. All piping is steam traced to prevent freeze-up during winter periods, since all plant units are located out-of-doors.

STANLEY KOTKOSKY, Supervisor, Pratt and Whitney Water Disposal plant, and GUY GRIFFIN, San. Engr., American Cyanamid Company, provided discussion of Mr. Burdoin's paper. In his remarks, Mr. Kotkosky described procedures to insure dumping the wastes properly and techniques learned to operate the plant effectively. He stated that chlorine residuals between 50 and 100 ppm as chloramine were established in the cyanide treatment tanks prior to dumping.

Mr. Griffin's remarks emphasized the desirability of steam tracing the plant lines and commented on the destruction of cyanides by means of alkaline chlorination. He pointed out that segregation of the various wastes in the main plant made possible the installation of batch treatment facilities at Pratt and Whitney. He observed that large volumes of flow render batch handling impossible and that continuous methods for plating and other wastes would be applicable.

## Stream Quality Factors†

"AQUATIC ORGANISMS AS AN AID IN SOLVING POLLUTION PROBLEMS" by Ruth Patrick, Curator, Department of Limnology, the Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania.

*H. O. Halvorson*
*Professor*
*Dept. of Bact.*
*Univ. of Illinois*
*Urbana, Ill.*

*S. I. Zack*
*Chief San. Engr.*
*Gannett Fleming*
*Corddry & Carpenter*
*Harrisburg, Pa.*

**Treatment**

*L. F. Warrick*
*Chief Tech. Services*
*Pollution Control*
*U.S.P.H.S.*
*Washington, D.C.*

*C. E. Renn*
*Professor*
*Dept. of San. Eng.*
*Johns Hopkins Univ.*
*Baltimore, Md.*

**Discussors**

It is important in stream sanitation that the whole biology of a stream and not only one part, such as the fishes, be understood. This requires thorough examination of the important links of the biological chain in the stream under consideration. Biological life may be affected by dissolved oxygen depletion, toxicity, heat, and physical factors such as oil, abrasives and settlable materials. Anything that damages algae affects an extremely important source of dissolved oxygen.

The biological effects of pollutants may be indicated in the laboratory by uses of diatoms, snails and fishes, which adequately represent stream biology. Samples are incubated under artificial light at constant temperature. The water selected for dilution of wastes in testing is natural water with chemical composition similar to that of the stream involved. The method is especially useful to industry in: differentiating between harmful and non-harmful wastes; determining the effect of changes in process; evaluating the effects of treatment; predicting the effects of batch discharges; and providing evidence useful in possible lawsuits. Final conclusions regarding actual stream conditions are based on total numbers of organisms, the overall pattern of organisms, and the relationships of certain types of organisms to other types.

A. R. GAUFIN, in Charge, Stream Sanitation and Sewage Treatment Unit, Biology Section, U.S. Public Health Service, Cincinnati, Ohio, discussed Dr. Patrick's paper.

There is a difference of opinion among biologists regarding the best use of biology in stream studies. The method of the Academy of Natural Sciences is good, but is costly and requires the services of trained scientists in many cases not available to stream pollution control agencies. The U.S.P.H.S. prefers an initial limited quantitative and qualitative survey, with emphasis on fish life.

The public considers fish yield the most important biological product of a stream. Some minor organisms may be destroyed by pollution without overall damage. Certain pure streams, especially those with low mineral content may be very poor biological producers. Limited organic pollution may actually increase production, and a stream that has recovered from the effects of pollution may be even more productive. If an initial limited survey reveals serious damage, a more detailed study may indicate past as well as present conditions. Some organisms are fixed and cannot escape from polluted water, and can not migrate into stream sections where they did not develop originally.

"DETERMINATION OF B.O.D. CURVE CHARACTERISTICS BY A SIMPLIFIED METHOD OF ANALYSIS" by Harold E. Orford, Assoc. Prof., Dept. of Sanitation, Rutgers Univ.,

† This session was reported by F. W. Kittrell, San. Engr., AEC, Oak Ridge, Tenn.

New Brunswick, N.J. and W. T. Ingram, Assoc. of Public Health, New York Univ., New York, N.Y. Paper delivered by Mr. Orford.

Biochemical oxidation of organic matter is an extremely complex process. It involves many varieties of biological forms which oxidize many kinds of organic matter at different rates of speed. Present mathematical methods of interpreting B.O.D. results are based on the assumption that the reaction is monomolecular, with the rate of oxidation proportional to the amount of organic matter remaining to be oxidized at any given time. If this were correct, both rate of reaction and ultimate B.O.D. for a sample would be constants. Analysis of B.O.D. curves for a number of samples has shown that these factors are not constants.

The rate of reaction (k) decreases and the calculated ultimate B.O.D. (L) increases as the period of observation used in the calculations is extended. The authors have developed a new logarithmic equation to express biological oxidation which gives as good fit to observed B.O.D. data as does the monomolecular equation. The method eliminates the instability of the constants and avoids the complicated calculations of the monomolecular approach. The logarithmic equation plots as a straight line on semilogarithmic paper.

HAROLD A. THOMAS, JR., Assoc. Prof. of Sanitary Eng., Harvard University, Cambridge, Mass., discussed the paper.

He agreed that there are weaknesses in the method that has been used for the past 35 years, but did not agree with the proposed new method. Equations are not devised to obtain a better fit of curves, but to improve the precision of methods. A type of graph paper probably can be found to fit the B.O.D. curve for any type of waste. Graphic methods are suitable to give an approximate interpretation of results, but such methods yield results that vary with the individual using them. In the field of hydraulics 30 years ago there were many proposals for dealing with the effects of friction on flow in pipes, but a simple formulation which accepts the sliding friction constant is still in use.

"THE BACTERICIDAL EFFECTS OF SEWAGE CHLORINATION" by Seth G. Hess, Director and Chief Eng., Alex N. Diachishin, Princ. Eng., and Paul De Falco, Jr., Senior Chemist, Interstate Sanitation Commission, New York, N.Y. Delivered by Mr. Diachishin.

The Interstate Sanitation Commission requires that sewage flowing into Class A waters be treated so that coliform organism numbers in the effluent do not exceed one per c.c. in more than 50 per cent of the samples tested. The coliform values from routine studies, plotted on a logarithmic axis against corresponding chlorine residuals on a coordinate axis, yielded curves having slopes that decreased continuously with increasing chlorine residuals. This indicated that the bacteria varied in susceptibility to the killing action of chlorine. As the more susceptible bacteria succumbed to the killing action continuously increasing residuals were required for the remaining hardier bacteria.

A curve of this type may be used for a given plant to determine the chlorine residual required to achieve any selected coliform content of the effluent. No correlation could be found between either killing action and B.O.D. or suspended solids removal in the treatment plants. Use of chlorine dosages in place of chlorine residuals was no more successful in the attempted correlation. The authors developed a hypothesis concerning the bactericidal effects of chlorine and tested it through theoretical analysis. Although the results of the analysis were not conclusive the authors felt that progress had been made and hoped that description of the approach would stimulate others working on the problem.

Discussion was by WALLACE W. SANDERSON, Assoc. San. Chemist, Division of Laboratories and Research, State Department of Health, Albany, N.Y.

He pointed out that results obtained in this study may have been variable because of different conditions of sample collection. Better correlation may have been possible if chlorine contact periods were known accurately. Inconsistent application and variable mixing of chlorine may have been factors. The orthotolidine method for chlorine residual does not differentiate among the various types of chlorine compounds, such as chloramines and various chlorinated organics, that may be present. The different types of compounds may have different killing rates.

"PHOTOSYNTHETIC OXYGENATION IN SEWAGE TREATMENT" William J. Oswald, Research Eng., Harold B. Gotaas, Prof. of Sanitary Eng., and Chairman, Dept. of Eng., Univ. of California, Berkeley, Calif., and Harvey F. Ludwig, Sanitary Eng., U.S.P.H.S., Washington, D.C. Paper delivered by Mr. Ludwig.

Various biological and chemical relationships in the oxygenation of wastes were investigated to determine the value of algae in providing oxygen in waste oxidation ponds. Experiments were conducted under controlled conditions in liter glass columns in the laboratory. An ingenious pump was devised to circulate the samples without damaging the delicate algae. Tests were continued for seven days and one-seventh of the sample was withdrawn and replaced by fresh sample each day to achieve dynamic equilibrium. Samples were inoculated with bacteria and two pure cultures of algae were used. Numerous chemical determinations were made on the samples. The chemical composition of the algae was determined and their rate of oxygen utilization and production were measured.

Observations also were made on a 60 foot long pilot plant pond. It was found that the algae produced most oxygen during the growing stage when food was plentiful. Prolonged detention in oxidation ponds was indicated to be harmful. The effects of light intensity also were observed. Optimum oxygen production occurred in the range of 400 to 1200 foot candles and exceeded respiration requirements for both bacteria and algae. Excessive light bleached the chlorophyl and caused rapid aging of cells, with resulting decreased oxygen production. This suggests the idea

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**Programmers**

that intermittent lighting may be most effective, and this will be investigated.

In the discussion which followed, it was suggested that present oxidation ponds may have excessive detention periods and produce old algal cells that may use more oxygen than they produce in receiving streams. If the stream has sufficient nutrients the old cells may be rejuvenated. More recirculation of pond effluents may be beneficial. Different species of algae prefer different sources of nitrogen.

## Industrial Waste Forum

R. W. Hess, Head of Pollution Research, Chemical Aniline Div. Allied Chemical and Dye Corp., Buffalo, N. Y., was the leader of a forum which discussed varied industrial waste treatment methods.†

### Flotation

Mr. Hess mentioned that flotation has long been used in the separation of minerals from pulverized ores, but adaptation of the method for liquid waste treatment is relatively new. Aeration is the basic process, but chemicals are used as auxiliaries to convert collodial, emulsified and dissolved matter to suspended solids and thus permit them to be floated by attached air.

F. S. Gibbs (F. S. Gibbs, Inc.) said chemical precipitation, in effect, hangs a sash weight on suspended matter and causes it to sink to the bottom. Aeration attaches air bubbles to suspended matter and causes it to rise to the surface. Where it is applicable flotation has distinct advantages over sedimentation. It makes effective use of atmospheric oxygen, which satisfies immediate oxygen demand, improves the action of added chemicals, and produces stabilized sludge which resists putrefaction for a considerable time. Flotation requires as little as 20 minutes, compared to two hours for sedimentation.

Robt. A. Baum (Bulkley and Dunton Processes Inc.) noted that flotation, by aeration in open tanks, depends on chance contact of the air bubbles with suspended particles. When air is applied under pressure in closed tanks the air comes out of solution to form bubbles and accounts for greater efficiency of air utilization. At present, industry appears to favor chemical precipitation, where most economical. Consideration should be given to aeration by sewage design engineers in connection with suspended and colloidal solid separation, oil and grease removal, and unloading of filters. Activated sludge might be separated by flotation.

General discussion brought out additional facts. Flotation of primary sewage may reduce suspended solids 60 per cent B.O.D. 40 per cent and oil and grease about 50 to 60. Flotation reduced the acid requirement for fat recovery from soap wastes by 40 per cent and the sludge may be drained in two hours.

### Skimming

In discussing the separation of oil by skimming, R. J. Austin, Standard Oil Co. (Indiana), and C. H. Bunn, Jr., Standard Oil Development Co., emphasized that petroleum refining uses about 17 gallons of water for each gallon of oil processed. The major portion is used in cooling and only 10 to 25 per cent comes in contact with oil. The wastes contain less than one percent of oil. Soluble oils, which coalesce and separate slowly, account for only a small fraction of the total. There are oil separation problems in other industries, but most are small by comparison with those in refineries. Package plants are suitable for many small installations.

Most plants prefer open separators since covered separators may be difficult to operate and increase the hazards of fire and explosions. Devices for skimming oil and removing sludge must not cause turbulence in separators. Wastes that will interfere with gravity separation of oil should be kept out of separators.

### Subsurface Disposal

Disposal of wastes underground may affect ground water supplies. Treatment may first be necessary to protect water supplies or to permit successful injection of wastes underground. Spraying wastes on land might be considered a subsurface disposal method.

N. J. Lusczynski (U.S.G.S.) pointed out that the effects of filtration of wastes in passage through underground formations are not well understood. In Nassau County (N.Y.) the sewage from one-half million people has been disposed of underground for many years. Bacteria apparently have been controlled and natural ion exchange and filtration appear to have been beneficial. These factors are not dependable in formations with crevices. In one case a waste containing hexavalant chromium traveled several miles underground and introduced 25 parts per million of chromium into domestic water supplies. Nitrates are little affected by filtration underground. Residual chlorine has been known to travel as much as 400 feet underground. Contamination from highly polluted streams has reached underground water. Usually treatment of underground water for public water supply is not necessary, but chlorination commonly is used as a factor of safety.

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**Industrial Waste Forum**

Subsequent discussion revealed that the Dow Chemical Company at Midland disposes of 3,000 gallons per minute of waste brines at depths of 4,000 to 5,000 feet. The brines are first impounded, settled and filtered. Brines for manufacturing processes are withdrawn from the same area into which the wastes are discharged. Some of the disposal wells take as much as 1,000 gallons per minute by gravity flow. In Kansas brine wastes from oil fields formerly were lagooned for evaporation, but the method was not successful. The wastes seeped into fresh water aquifers used as sources of public supply. The practice of returning the brine to deep underground brine formations was adopted. Observation wells are used to prevent levels of the brine formation from rising into fresh water strata. Kansas has more brine disposal wells than all other states combined and has not lost a single public water supply because of brine intrusion.

† This session was reported by F. W. Kittrell, San. Engr., AEC, Oak Ridge, Tenn.

### Lagooning and Sodium Nitrate

Lagooning may provide a simple, economical method of waste control if sufficient cheap land is available. There are, however, potential disadvantages. The waste may cause odors, and may seep into surface or subsurface waters. Portions of the waste may have to be discharged periodically and disposal of sludge may present a problem. Odor nuisances may be controlled by addition of sodium nitrate.

In Minnesota according to H. G. ROGERS (State Dept. of Health), lagoons are used principally for vegetable canning wastes. The lagoons hold wastes for an entire season. Sodium nitrate has been used to control odors, but the cost may be greater than the plant can afford; it should be considered a temporary expedient rather than a permanent treatment method.

Both cheese and vegetable canning wastes are lagooned in Wisconsin. O. J. MUEGGE (State Board of Health) noted that before the use of sodium nitrate was adopted the only successful lagoons were those in sandy soil permitting percolation. In the 10 years that sodium nitrate has been used, the number of lagoons has increased from 14 to more than 50. Lime, sodium hydroxide and oil seals as well as sodium nitrate have been used to control odors. Sodium nitrate is added as necessary, and if B.O.D. is kept below 300 to 400 parts per million the results are satisfactory. During the first two weeks of a new canning season dissolved oxygen decreases and plankton increase until stability is reached. After the end of the season, B.O.D. drops rapidly.

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**Operators' Forum**

### Anaerobic Digestion

Industry is adapting the methods of sewage treatment to its waste treatment needs. Many sewage treatment methods are adaptations of natural purification processes. One of these is anaerobic digestion which does not require the high dilution needed to support aerobic purification.

W. J. FULLEN (George A. Hormel Co.) described research on anaerobic digestion of meat packing wastes which has been in progress for three and one-half years and in the pilot plant stage for the last two years. Operation is continuous, with daily sampling. The basic feature of the process is the contact of fresh wastes with anaerobic sludge. It can handle a packing waste that varies widely in strength and achieve 93 to 96 per cent B.O.D. reduction in 24 hours. Suspended sloids are reduced about 95 per cent.

GEO. J. SCHROEPFER (Univ. of Minnesota) said it once was thought that wastes must have at least 1,000 ppm of organic solids to be treated economically by anaerobic digestion. Colculations of heat balances indicate that wastes with lower organic solids may be treated economically if the temperature of the raw waste is correspondingly high. It is assumed that 95° F. is necessary for optimum digestion. If the wastes have 1,800 ppm of organic solids no heat need be added to the process, provided the raw waste temperature is 80° F.

### High Rate Filters

Treatment on high-rate filters may be regarded as an improvement on nature's aerobic purification process.

High-rate filters provide roughing treatment, it was pointed out by D. S. MERRITT (Campbell Soup Co.), and usually are associated with secondary treatment. High-rate filters have been used to replace primary sedimentation in treatment of tomato canning wastes. Coarse stone of 2.5 to 4 inches diameter is used. The normal pH of 4.5 to 5.0 had to be adjusted to 6.0 to prevent clogging by mold growth. A recirculation ratio of 5 to 1 was found to be optimum. Optimum dosage ware was 9,000 pounds of B.O.D. per acre foot, and rates as high as 11,500 pounds per acre foot were tried without serious drop in efficiency. B.O.D. removals were 32 to 40 per cent.

C. H. NICHOLS (Merck and Co.) described wastes from a Merck plant. Initially these were evaporated and the concentrates buried in pits. The process produced odors and was excessively expensive. Pilot plant experiments were undertaken with biofilters as a preliminary step before standard filtration. All wastes from the plant, including one that was toxic, were combined for application to parallel filters. It was found that a four foot filter bed gave better results than a six foot bed. Biofilters can take 3 to 4 times the design loading for short periods without damage. They do not accomplish as much nitrification as standard filters. The high flow rates prevent odor and minimize filter fly production. A new treatment plant is being designed for 70% B.O.D. reduction, but it is anticipated that even greater reduction may be accomplished. Solid wastes do not harm the filters. Sludge will be ploughed under on friable land at rates of 0.2 to 0.4 gal. per square foot per day.

## The Operators' Forum

J. HENRY L. GILES, Asst. City Engr., Meriden, Conn., presided as leader of the final technical session. This session was for many plant operators the high point of the meeting.*

C. E. KEEFER, (Deputy Sewerage Engineer, Baltimore, Md.) opened the Forum with a discussion of pumps. He stated that submerged pumps are a nuisance for pumping sludge, for reasons obvious to plant operators. Regarding pump maintenance, he suggested attention be given to adequate water pressure on packing glands, which insures a minimum of sleeve wearing as well as prevents sewage or sludge from leaking. The primary consideration in pump selection should be to avoid a flat characteristic curve. Insure that sufficient head capacity over a wide range is available, allowing flexibility under different operating conditions. Mr. Keefer answered a question concerning packing glands for pumps saying he preferred water rather than grease.

T. A. BERRIGAN (Dir. & Chief Engr., Boston Metropolitan District) commented on grit handling. In supporting his belief that grit should be handled as little as possible, he con-

* This session was reported by V. W. Langworthy, Res. Chem., The Chlorine Institute, Inc., New York, N.Y.

siders that the District should be allowed to continue pumping washed grit to sea. After 60 years, no complaints from navigation have been received, he said.

### The Plant Laboratory

The sewage and industrial waste treatment plant laboratory received attention, when SHERMAN CHASE, (Metcalf & Eddy, Boston, Mass.) pointed out that the best laboratory equipment is to no avail without the eyes, ears, nose and brain of a competent laboratory analyst. LEROY W. VAN KLEECK, Principal San. Engr., Conn. State Health Dept., suggested as basic to plant operation, settleable solids estimation with the Imhoff Cone, pH and residual chlorine determinations. He has encouraged the methyl orange alkalinity titration in digestor operation and settling tests for digestor supernatant liquor, as well as the relative stability tests in the operation of secondary treatment plants.

J. O. BARRETT (Cleveland, O. Westerly Sewage Treatment Plant), seconded Mr. Chase's thoughts conceding the analyst, adding that the results of bacteriological analyst may appease local newspapers. Laboratory size should not be overdone, Mr. E. B. COBB (Metcalf & Eddy, Boston, Mass.) mentioned, nor is it advisable to provide equipment not likely to be used. F. H. MILLER, (Chief Engr., Hampton Roads, Sanitation District, Norfolk, Va.) emphasized the necessity of well equipped laboratories when it is desired to trace sources of industrial wastes. He added that it is essential to perform analyses for $H_2S$ in connection with pumping stations, force mains and siphons.

J. R. SZYMANSKI (Supt., New Britain, Conn., Treatment Plant) offered comments that included analyses essential for the successful operation of a Guggenheim process treatment plant. A laboratory is essential to control the process as well as to insure purity of the receiving stream; which is controlled for eight stream miles, in his case. Among the determinations carried out at the New Britain plant are: suspended solids, B.O.D., ammonia, iron (from pickling wastes in concentrations as high as 800 ppm in both ferric and ferrous forms), stability, biological (microscopic tests), settleable solids, and alklainities.

Agreeing that laboratory analysis, intelligently interpreted, are highly important, L. H. ENSLOW, (Editor, *Water & Sewage Works*) wondered how many operators made analyses of the carbon dioxide content of their digester gas, a test which can have more significance than the pH at which the digester is operating. Answering a question concerning how to interpret the carbon dioxide concentration, Mr. Enslow pointed out that each digester is different, but in any case, carbon dioxide indicates acidity and in general the less present, the better for efficient digester functioning. He added that the method of choice in his opinion was to absorb the carbon dioxide in sodium hydroxide rather than using the Orsat procedure.

Recent experience at Philadelphia were related by RALPH HOOT, (Supt., Sewage Disposal Plants, Phila., Pa.). These included equipping of three laboratories in the various plants, emphasis on the carbon dioxide gas analysis, and the development of three young men to be laboratory technicians. He also mentioned the use of a jeep, in connection with sampling operations, by men whose sole task is collection of sewage and sludge samples. The laboratory at the Philadelphia northeast plant is used as a central point from which standard solutions are dispensed to the other two analytical centers.

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*Hampton Rds., Va.*

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*E. B. Cobb*
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*J. B. Syzmanski*
*Supt.*
*Treatment Plant*
*New Britain, Conn.*

**Operators' Forum**

### The Plant Personnel

The subject of personnel was introduced by Mr. Giles, as he inquired about rating systems for sewage treatment plant employees.

A. H. NILES (Commissioner of Sewage Disposal, Toledo, Ohio) outlined the system used at Toledo. Prospective operators must begin as laborers, making it difficult to hire personnel with more than a high school education. The beginning hourly wage ($1.54) is mandatory for three months, after which time promotion to the operating staff at $350 per month is possible. Toledo has a pension plan for employees, with consideration being given to a point basis for seven yearly salary increments.

A picture of the industrial approach to employee rating was presented by ROY WESTON (San. Engr., The Atlantic Refining Co., Phila., Pa.). A job analysis and evaluation study was made which included considerations for the mental and physical ability required to perform each job. Careful attention was paid to similar job conditions in fairness to those individuals performing nearly identical operations in the same vicinity. He suggested a similar study be carried out by sewage treatment officials.

Further comments were offered by H. J. GRAESER (Asst. Supt. City Water Works, Dallas, Texas) concerning job evaluation as it was carried on at Dallas. He believes the procedure to be fair and workable, though not an easy task. Professional job analysis consultants were retained to work in conjunction with a committee, representing the municipal organization.

Discussion of prevailing wages brought out that operators at Bay City, Michigan receive $2.28 hourly. New Britain, Conn., laborers receive $1.50 per hour with two-week annual vacation and sick leave accumulative to 90 days, with assistant operators receiving the same wage and considerations. Senior shift operators are on a $74.00 per week basis, with shift operators receiving a weekly wage of $60.00. It was pointed out that laboratory work is performed by a girl, whose duties also include office and secretarial work. Laborers at Meriden, Conn. receive $1.31 hourly, while operators and helpers respectively, receive $1.88 and $1.50 hourly at the waste treatment plant of Sharp and Dohme Pharmaceutical Co., Philadelphia, Pa.

Important comments concerning job evaluation at Austin, Texas were made by A. H. ULLRICH, (Supt., Water and Sewage Treatment, Austin, Tex.). Job evaluation studies were carried out by a committee that had been instructed on procedure by a professional consultant. Sixteen

job analysts contacted each class of employee (each employee signed his own job analysis sheet) and the sheets were routed through section heads and supervisors for signature. In general, the lower bracket jobs were easiest to evaluable, with analysis of higher technical groups increasingly difficult. The Austin Committee evolved 650 job classifications for 1700 employees, with the establishment of a re-evaluation procedure to satisfactorily fill the originai specifications. Concensus of opinion as presented by Mr. Ullrich is that job evaluation is a good, but arduous, system. Mr. Weston indicated that job evaluation is an aid to judgment, to determine what rating should actually be applied to a given job.

### Byproduct Conservation

A brief discussion of sewage plant sludge and by-products conservation was presented by DR. B. P. SKULTE (Stone and Webster Eng. Co., Brookline, Mass.) who is genuinely concerned about the loss of valuable materials when sludge incineration is practiced. WM. N. WELLS, (Supt. Sewage Treatment Plant, San Antonio, Texas) commented that at San Antonio, sewage plant effluent is used to irrigate 4,000 acres of pasture land, and that sludge is utilized for fertilizer purposes. C. E. KEEFER described the existing cooperation between the City of Baltimore, and the Sparrows Point plant of the Bethlehem Steel Co., wherein trickling filter plant effluent is conditioned by the steel company for rolling mill purposes. S. L. ALLISON, (Supt., Sewer Department, Corpus Christi, Texas) mentioned that sewage plant effluent is supplied to a refinery where, after chlorination and pH correction it is used as cooling water.

### Aerobic Treatment

Comments with regard to trickling filter dosages were offered, Mr. Giles referred to a Connecticut plant being operated at a 26 mgad dosage rate. G. L. MORRIS, (Supt. Sewage Treatment Plants, Oklahoma City, Okla.) indicated a continuous load could be maintained by recirculation, of 40 mgd applied as 4300 lbs. B.O.D. per acre per day and 400 lbs. B.O.D. per acre per day on primary and secondary filters respectively. Mr. Graeser indicated that two-stage trickling filters have been dosed as high as 420 mgad in California, and a single stage loading of 8000 lbs. B.O.D. per acre per day has been reported.

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*Atlantic Ref. Co.*
*Newton Sq., Pa.*

**Discussors**

### Sludge Digestion

E. A. LOCKE, (Engr., Sewage Treatment Plant & Pumping Stations, Hartford, Conn.) reported cleaning digesters after 12 years operations. The procedure followed, was to drain a digester, allow the sludge which had become caked on heating coils to dry, then six men cleaned the coils in six or eight hours. Coils nearest the center of the digester were more difficult to clean, but no widespread corrosion was found. Sludge from the next digester to be cleaned was used as seed to start the freshly cleaned unit. Heat transfer and sludge digestion were very much improved, gas production increased from 150,000 cu. ft. to 200,000 cu. ft.

Corrosion of heater coils at Corpus Christi, Texas was reported by Mr. Allison. Coils ruined in eight months by high salinity were made to last nine years through the installation and operation of a home-made cathodic protection unit. He mentioned the successful use of sludge as a soil conditioner, preventing the packing of soil particles into an impervious mass.

Mr. Hoot reported on how *not* to initiate digester operation, relating experience at the Philadelphia Northeast plant when winter start-up was attempted prior to the availability of the external sludge heating equipment. The heating equipment as finally installed utilizes the submerged combustion principle.

Temperatures at which optimum digester operations occur was submitted by Mr. Van Kleeck to be 95° F. G. A. PARKES (Hyperion Plant, Los Angeles, Calif.) said his experience with the operation of eighteen digesters has included temperatures of 85°—90°—100° F. with two digesters currently operating at 120° F. and producing a highly filterable sludge. His plea is for generous specifications as regards sludge heating facilities, since he has found it necessary to use direct steam injection in digester start-up. He has experienced as much as 40 days of poor operation on start-up, before digester temperature leveled off and alkaline operation was established. Lime addition proved of no value whatsoever.

Active participation by those in attendance at the Operators' Forum indicates the desirability of including such a session at future Federation meetings.

Final event of the annual conference was an inspection tour of the recently completed pollution control project at Owl's Head Park, Brooklyn. Many operators took advantage of the opportunity to observe the unique features of the plant and to question representatives of the New York City Department of Public Works as well as manufacturers' representatives who explained equipment operation. The sludge vessel, Owls Head, berthed nearby, was visited by the inspection party.

## New Chlorine Handbook by Canadian Industries Ltd.

"Chlorine" is the title of an authoritative new 48-page handbook published by Canadian Industries Ltd., Chemicals Dept., Montreal, Can. It contains useful information for all engaged in the purchase, handling, and use of liquid or gaseous chlorine.

The contents include discussions of physical and chemical properties, chlorine containers, materials of construction, sources of trouble in chlorinating systems, safety precautions, and many excellent charts and tables. Copies of the handbook are free on request.

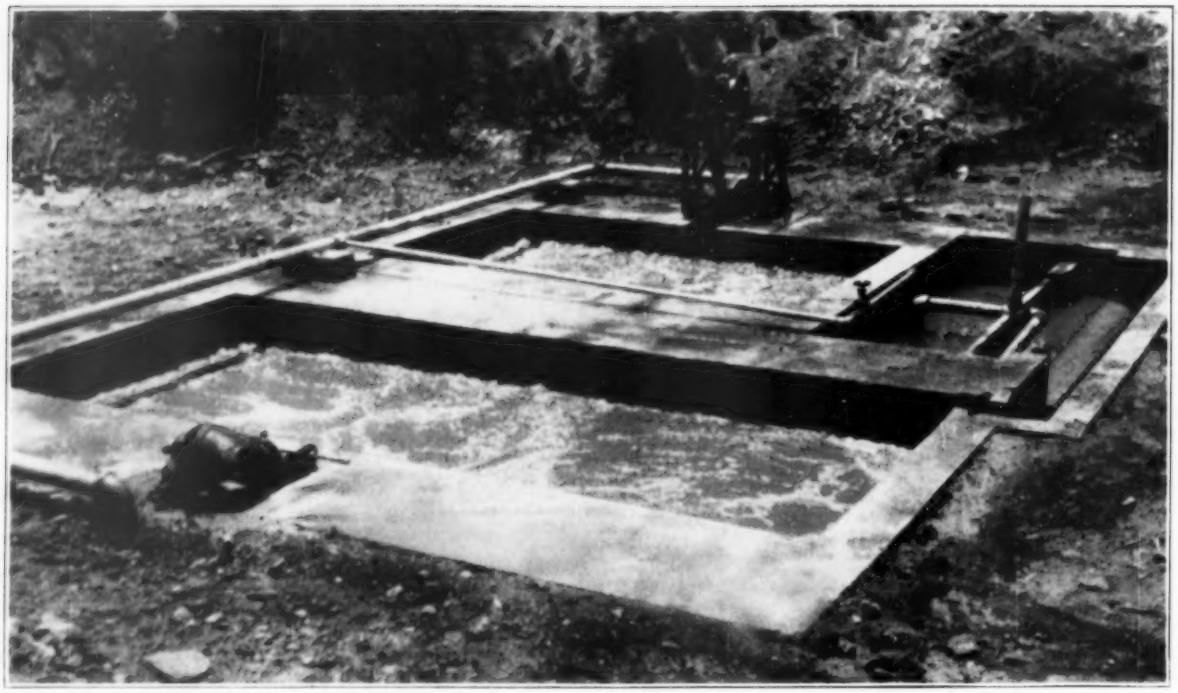


Fig. 1—MILK waste treatment plant using activated sludge process. Near Germantown, Ohio.

# Milk Waste Treatment by Activated Sludge

## Features Contributing to Successful Operation With a Minimum of Supervision

*by* PAUL M. THAYER, *District Manager, Chicago Pump Co. Chicago, Ill.*

USE of the activated sludge process for treatment of milk waste has come into increasing favor during the past three or four years. One new development of this type was discussed at the Sixth Purdue Industrial Waste Conference. The unique feature of the new plant was its design to treat both the milk waste and the sludge resulting from treatment in one operation. The initial operating results from two plants of this type were given previously, together with the recommended design factors. A third plant has been placed in operation at the Cherry Grove Dairy near Toledo, Ohio. Each of these three plants has different arrangements, although all three were designed to operate on the same basic principle.

This paper is based on a study of the operating features and results of the three plants. Since references will be made to each plant throughout this paper, a brief description of some of the features will be helpful.

### Operating Features and Results at Three Milk Plants

The first plant placed in operation was that at the George Schell Creamery near Germantown, Ohio. See Fig. 1. This plant includes two aeration tanks in series followed by a single settling tank; all of the sludge from the settling tank being returned to the head end of the first aeration tank by means of an air lift. The pipe connecting the aeration tank to the settling tank has a vertical leg in the aeration tank. The vertical pipe extends approximately 6 inches above the normal water surface of the aeration tank. The section above the normal surface has a 1-inch slot that prevents surges of flow to the aeration tank from entering the settling tank.

The second plant placed in operation was at the Blossom Hill Dairy in Dayton, Ohio. See Fig. 2. This plant was provided with an aerated holding tank into which the raw sewage discharged and from which it was pumped by means of an enclosed shaft vertical Non-clog pump to a division box. The division box was fitted with a 90° V-notch weir over which the flow to the aeration tanks passed, and a rectangular weir over which the flow back into the holding tank passed; the weirs can be adjusted to discharge the total flow through the aeration and settling tanks at an approximately uniform rate over 24 hours, even though the entire flow is received in the holding tank during a six or seven hour period.

The third plant, placed in operation in the spring of 1951, was that at the Cherry Grove Dairy near Toledo, Ohio. This plant is provided

with a division box into which the raw sewage flows directly. From the division box the flow is discharged to the aeration tank over a 90° V-notch weir, and also to the aerated holding tank over a rectangular weir. The contents of the holding tank are pumped back through the division box by means of an enclosed shaft vertical Non-clog pump. The weirs in the division box can be adjusted so that the entire flow can be discharged through the aeration and settling tanks at an approximately uniform rate, even though most of the flow is received in a six or seven hour period.

It will be seen from the descriptions that these waste treatment plants operate at dairies which normally run one shift per day. This means that the entire flow enters the plant within five to seven hours. During this short time the character of the sewage changes radically, and the rate of flow varies more than 1000 per cent.

The function of the aerated holding tank is two-fold; first, to equalize the flow through the balance of the plant, thus assuring practically uniform overflow rates in the settling tank and, consequently, much clearer effluent; and secondly, to composite the raw sewage before it goes to the aeration tank. The latter function is important, inasmuch as the waste discharged during the daily cleanup period usually contains considerable caustic which will maintain the pH of the entire daily flow on the alkaline side and at a fairly constant figure during the entire 24 hours.

The conditions under which the aerated holding tank operates create some very interesting design problems. The successful operation of the entire plant depends, to a large extent, upon the practical solution of these problems. A schematic flow diagram, illustrating the location of the aerated holding tank, is shown in Fig. 3.

Probably the simplest way to illustrate the many factors involved in the design of an activated sludge plant for treating milk waste is to describe the design features of a typical small milk processing plant.

## Small Milk Processing Plants

For the purpose of developing a design certain arbitrary assumptions will be made. There are many isolated milk processing plants handling from 20,000 to 40,000 pounds of milk per day and making butter and/or ice cream, bottle milk for the trade, but which do not make large amounts of cheese. For this particular design it will be assumed that the average milk intake is 30,000 pounds per day. It will also be assumed that the milk plant uses reasonably good housekeeping methods. It is assumed that the contaminated water is separated from the uncontaminated water, and that only the contaminated water flows to the waste treatment plant. The wastes entering the sewers will be assumed to be those from can washings, bottle washings, floor drippings, normal spillage, and the daily cleanup.

The basis of design of the typical activated sludge plant for treating the milk waste is given in Table 1.

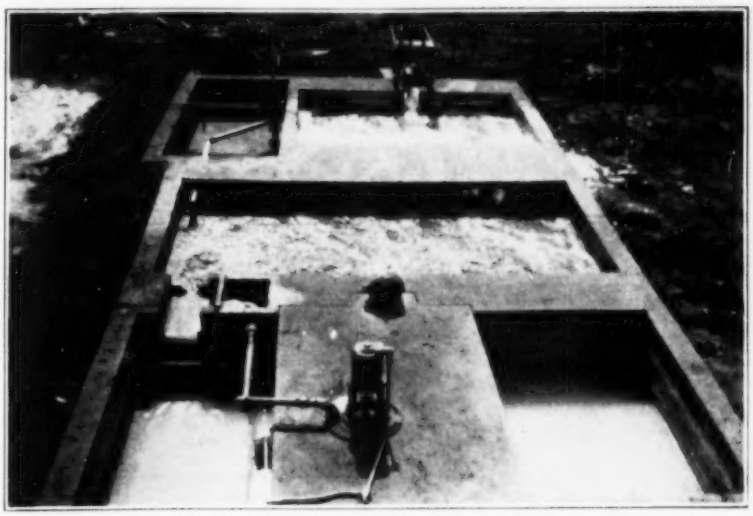


Fig. 2—ACTIVATED sludge treatment of milk wastes. Dayton, Ohio

## Waste Treatment Design Requirements

The air requirement of 5000 cu. ft. per pound of B.O.D. is ample to oxidize the milk solids thoroughly as well as to treat the liquid wastes in the small plant. In larger plants a lower volume of air is adequate because of more uniform rate of flow and more uniform composition of the milk wastes.

Table I
BASIS OF ACTIVATED SLUDGE PLANT DESIGN

| | |
|---|---|
| Raw milk processed per day | 30,000 lb. |
| Waste, of total milk received | .02 % |
| Milk wasted per day | 600 lb. |
| B.O.D. per day | 60 lb. |
| Waste, per 1,000 lbs. milk | 400 gal. |
| Total waste per day | 12,000 gal. |
| B.O.D. of waste | 600 ppm |
| Holding tank 50% of average daily flow (Min.) | 6,000 gal. |
| 75% of average daily flow (Desirable) | 9,000 gal. |
| Aeration tank (36 hours detention) | 18,000 gal. |
| Settling tank (4 hours detention) | 2,000 gal. |
| Total air required 5,000 cu. ft. per lb. B.O.D. | 300,000 cu. ft. per day |
| CFM air per minute | 208 |
| CFM air for air lift | 10 |
| CFM air for aerated holding tank (3 cu. ft. per ft. length of tank) | |
| CFM air for aeration tank (Total air less that used by air lift and aerated holding tank) | |

Generally the most economical plant layout is one that will result in a rectangular overall layout with the three tanks nested together, and having as many common walls as possible. The overall length and width should be nearly equal, providing, however, that the width to depth ratio is reasonable and that the depth is not excessive. It must be remembered that the greater the tank depth, the greater the air pressure required; hence, at greater depths increased horsepower is required to produce the necessary air.

## The Aeration Tank

In order to arrive at the ultimate design the cut and try method will be used. The width to water depth ratio for the aeration tank will be assumed to be 1.5 to 1. The 18,000 gallon aeration tank contains 2400 cu. ft. A standard air diffusion unit that can be swung up out of the tank for cleaning or replacement will be used to serve an aeration tank 20 feet long. If a tank length of 20 ft. is assumed, a cross-sectional area of 120 sq. ft. is indicated. Allowing 7 sq. ft. for fillets and a width to water depth ratio of 1.5 to 1, a tank of 14 ft. wide by 9 ft. water depth is the size obtained by computations. The air diffusion unit should be located about 18 inches above the bottom of the tank. This will create a static pressure on the tubes of 3.2 pounds per square inch; allowing a loss of pressure through the air filter, piping and diffuser unit of 0.3 pounds per square inch, the blower pressure needs to be 3.5 pounds per square inch. Since it is desired to

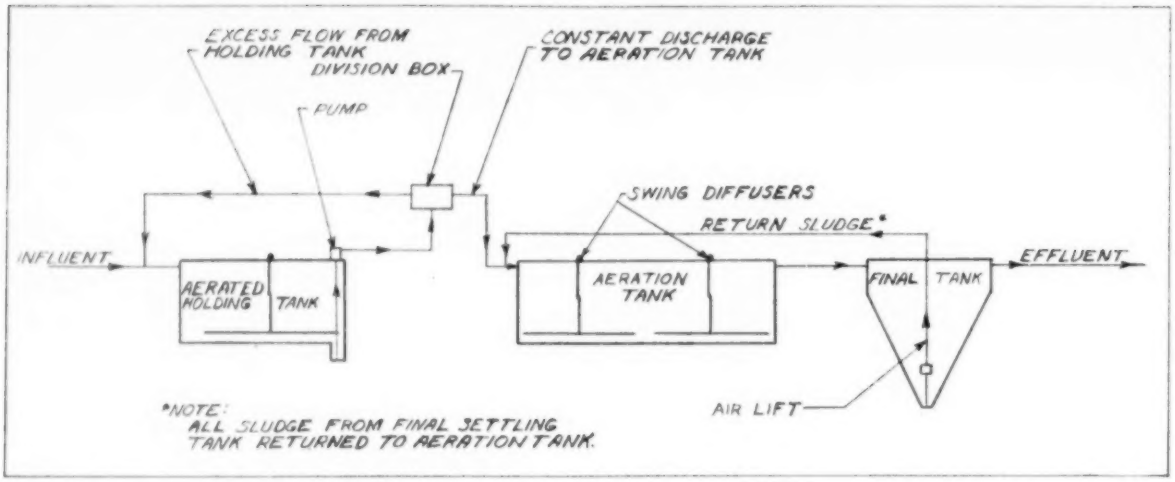



Fig. 3—FLOW DIAGRAM illustrating unit relation in activated sludge treatment of milk wastes

operate the air lift in the settling tank from the same blower, the air lift will be set at the correct elevation to operate properly at 3.5 pounds per square inch.

### The Settling Tank

Attention is now centered on the settling tank, in which a length to width ratio of about 2 to 1 is desired. The tank should have a single hopper bottom with side slopes not less than 60 degrees. The hopper bottom should be 12 inches by 12 inches. If the upper third of the hopper serves for settling and the lower two-thirds serves as a sludge storage, a settling tank 6 ft. wide by 11 ft. long with a side water depth of 3 feet and a hopper depth of 8 feet 9 inches is recommended. Entrance to the settling tank from the aeration tank is through a four-inch pipe located at the mid-point of the settling tank and about one foot six inches below the water surface. A baffle extending across the settling tank about two feet from the entrance end and to a point about three feet below the water surface, will prevent short circuiting and will serve to retain any grease that might build up as a scum on the settling tank.

The effluent launder is to be located crosswise of the tank and an appreciable distance away from the end wall. The reason for locating the effluent launder away from the end wall is to avoid the possibility of setting up a major current that follows the outer contour of the tank, down into the hopper and up the outside wall to the effluent.

### The Air Lift

The air lift is to be designed to remove the sludge from the bottom of the hopper and return it to the influent end of the aeration tank. The rate of sludge return is to be high in relation to the overflow rate of the settling tank itself. It will run as high as from 300 to 700 per cent. This high rate sludge return creates a constant stream of liquid that flows down all the slopes of the hopper. Thus, all solids which settle out are picked up by the stream and carried to the air lift suction without having much opportunity to stick to the side walls. The combination of a high sludge return rate and a nearly constant overflow rate, with baffling and effluent launder properly designed will make for maximum effluent clarity.

### Aerated Holding Tank

The size and location of the aerated holding tank are largely determined by the size and location of the aeration and settling tanks. If the settling tank is laid out at right angles to the aeration tank with one side in line with the end of the aeration tank, a balanced rectangle is possible (if the design for the holding tank fills in the remaining corner). By making the bottom of the aerated holding tank at the same level as the aeration tank, a water depth of approximately 9 ft. is obtained. Allowance for proper fillets and bottom slope is made; a tank volume of approximately 9000 gallons is obtained. This is the desired figure stated earlier.

### The Combined Units

The plan view of this plant is shown in Fig. 4. A cross section through the aerated holding tank and aeration tank is shown in Fig. 5.

A study of Fig. 5, which shows the relationship of the constant water level in the aeration tank to the extremes of high and low water level in the aerated holding tank, will give a clue to two of the major factors encountered in the design and operation of a plant of this type.

One of these factors is the proper distribution of air to the three points of use—aeration tank, air lift, and aerated holding tank. The other factor is the return or recirculation of sewage from the aerated holding tank to the aeration tank in such a way that the highly fluctuating flow into the aerated holding tank, and the consequent highly fluctuating head differential between the two tanks, is evened out. The flow through the aeration tank and settling tank must be nearly constant over a 24 hour period regardless of the rate of flow of raw sewage to the aerated holding tank.

Air is supplied to the air lift at a constant pressure from the main supply line. The volume is varied to control the amount of sludge return from the settling tank to the head end of the aeration tank. The control is accomplished manually by means of a valve on the supply line to the air lift.

The aeration tank requires a constant volume of air at a constant pressure; this pressure is the sum of the static head of the mixed liquor over the diffuser units and the resistance of the piping and diffuser media.

The aerated holding tank requires a constant volume of air at a widely varying pressure; this pressure is the sum of the static head over the

diffuser units and the resistance of the diffuser media and piping.

### Air Serves Three Purposes

In those plants now operating which have aerated holding tanks, all three services are supplied from one blower. Air supplied to the holding tank is controlled by hand adjusted valves. Accurate control of the air supplied to holding tank would require rather close supervision, which cannot be counted on in small plants. It is obvious that some other method of distribution of air must be found. The simplest arrangement, and one that may prove cheapest in the long run, would be to provide one blower for the aerated holding tank, and a separate blower for the air lift and aeration tank. Means can be worked out to supply the holding tank air from the main blower with automatic or semi-automatic control of the volume so supplied, regardless of the pressure differential. However, such controls become complicated and are expensive. Another arrangement would be a double piping system from the blower to the diffuser unit, each sized to supply a fixed portion of the total requirements at full pressure, and one sized to furnish the proper amount with the tank half or one-third full. The first pipe would be fitted with a float-controlled valve to shut it off when the water level dropped to a pre-determined point.

### Problem of Constant Flow

The other major problem is how to convert the highly fluctuating and contaminated flow into the aerated holding tank into a continuous and nearly constant flow through the aeration and settling tanks. The arrangement adopted consists of a centrifugal pump running continuously, except when the holding tank water level drops to the level of the top of the diffuser media, discharging through a division box. The division box is so located as to discharge liquid over a 90° V-notch weir to the aeration tank, and over a rectangular weir back to the holding tank. The relative elevation of these two weirs can be adjusted to get an approximately constant flow over 24 hours through the aeration and settling tanks, even though all the flow enters the holding tank in from five to seven hours and at highly fluctuating rates during this short period.

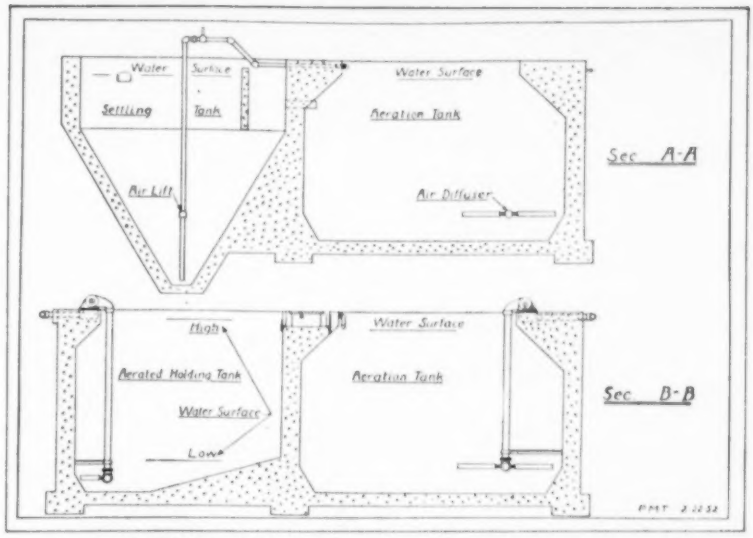



Fig. 5—SECTIONAL VIEW illustrating constant water level in aeration tank

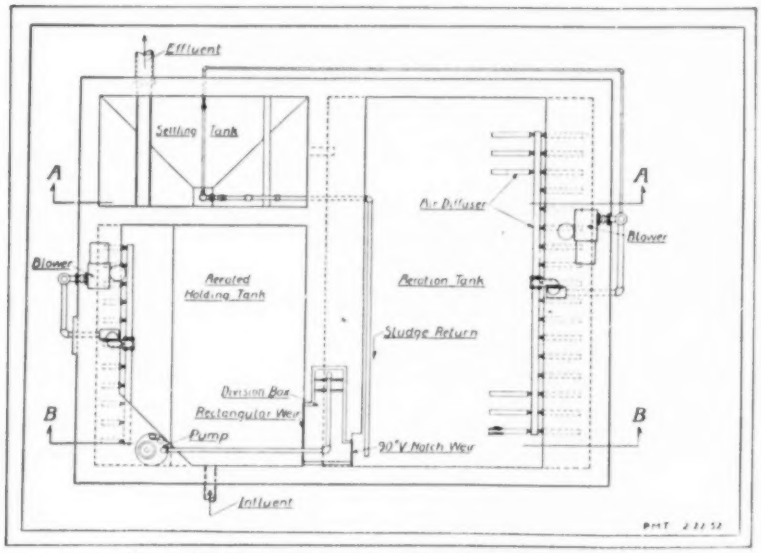



Fig. 4—PLAN showing compact arrangement of required units

### Summary

This paper was prepared to provide information which will be helpful to engineers who are faced with milk waste treatment plant design problems.

Experience has proven that the design factors suggested in the paper "New Design of Activated Sludge Plant to Treat Milk Wastes," submitted to the Sixth Purdue Industrial Wastes Conference, were conservative and that plants designed on the basis suggested will operate successfully with a minimum of supervision.

The inclusion of an aeration holding tank is highly beneficial in milk waste treatment plants which treat the waste from milk processing plants which operate on a one shift basis. Aerated holding tanks are not required for plants treating the waste from large milk processing plants which operate on a three-shift basis, or where the fluctuation in flow over 24 hours is not greater than that encountered in ordinary municipal sewage treatment plants.

### Acknowledgment

The George Schell Creamery waste treatment plant near Germantown, Ohio, was designed by Walter A. Rabold and John F. Surman, Architects and Engineers.

The Blossom Hill Dairy waste treatment plant, Dayton, Ohio, was designed by Stellar Engineering Company, Consultants.

The Cherry Grove Dairy waste treatment plant, near Toledo, Ohio, was designed by L. Lewandowski and Son, Engineers, Toledo, Ohio.

85% Magnesia being applied on 8-in. pipes from heat exchangers to digesters.

# How a Modern Sewage Treatment Plant Was Insulated

*by* AUSTIN F. McCORMACK, *Vice President,*
*Asbestos Construction Company, Inc., New York City*

THE Owl's Head Pollution Abatement Project of New York City was officially placed in operation in April 1952. Located near the entrance to New York Harbor, the plant represents the newest addition in a long-range program of complete sewage treatment for the Greater New York area. The designed capacity of the plant is for an average of 160 million gallons per day. The immediate flow will approximate 120 mgd.

Some of the most modern equipment and advanced sewage treatment techniques were incorporated in this plant. After passing through screening racks and grit chambers, where large solids and sand are removed, the raw sewage flows into the aerating channel where it is mixed with activated sludge. Aeration tanks are the next step. Here continuous agitation with compressed air induces the growth of aerobic bacteria, which produces the biologically active medium. The suspended solids of the raw sewage are entrapped on the gelatinous surface of this medium. The aerated mixed liquor then flows into the final settling tanks. In these tanks the solids of the mixed liquor (activated sludge) has a chance to settle out at the bottom of the tanks. The effluent from the settling tanks (the purified sewage) is discharged into the bay.

Of the activated sludge, a predetermined portion is sent back into the aerated influent channel to keep the process on a continuous basis. The excess sludge, or the portion not needed for maintaining the process, is put through thickeners and then pumped into the digesters. Owl's Head uses two-stage digestion. Raw sludge is added to the digesters as digested sludge is removed.

## Benefits Derived from Digestion

Two distinct purposes are achieved by the digestion of the sludge: First, by permitting the sludge to undergo anaerobic fermentation, it is reduced in volume to a considerable degree. Since all of the digested sludge is transported and dumped at sea, the advantage of reduction in volume is apparent. The second benefit from digesting the sludge is that in this process a valuable gas is liberated. Consisting principally of methane ($CH_4$), sludge gas, which has a higher heating value (600 to 650 Btu) than public utility manufactured gas approximately 570 Btu, is an ideal fuel for gas engines. Six such engines have been installed at Owl's Head. They are actually dual-fuel engines, as they can also be operated on Diesel oil or any combination of gas and oil. These engines generate all the electricity needed for this highly mechanized plant. In addition, the exhaust gases and cooling water from these engines are utilized for space heating and for maintaining the proper temperature in the digesters.

## Heat Recovery

Exhaust gases from the engines pass through the waste heat boilers, where these gases are cooled from about 650 F to no lower than 300 F. (The lower temperature limit is maintained to avoid condensation in the stack). In cooling, the exhaust gases give up their heat to the engine cooling water raising its temperature to about 130 F.

The engine cooling water circulates in a closed loop. After leaving the waste heat boilers at 130 F, it flows through heat exchanger tubes, transfers its heat to the water in the shell, and leaves the heat exchanger at 110 F to be returned to the engine cooling

jackets. The cooling water system operates under 50 psig.

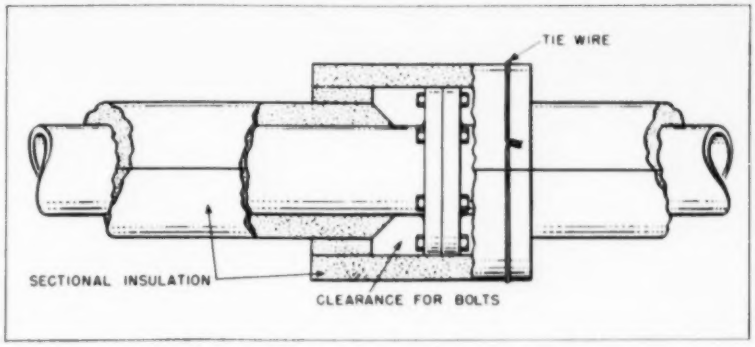
Water in the heat exchanger shell is utilized in two ways. One, it heats the buildings by means of a hot-water heating system. Two, it keeps the digestion tanks at approximately 90 F, at which temperature digestion of the sludge proceeds more rapidly.

### Heat Conservation

The heat generated by the engines must be carefully conserved so that, especially at low temperatures in the winter time, sufficient heat will be available for the digestion tanks and the buildings. An auxiliary oil-burning boiler has been provided for heating purposes, but operating costs increase every time it has to be used. In an effort, therefore, to keep heat losses to a minimum, all hot water transmission lines, engine exhaust lines and waste heat boilers were insulated with 85% Magnesia, or diatomaceous silica insulation.

The waste heat boilers, which operate at approximately 650 F, were insulated with diatomaceous silica, 3-in. thickness. Joints were pointed up with insulating cement. The insulation was secured with 4-strand, 19-wire galvanized steel cable on 2-ft. centers. Hexagonal wire mesh was stretched tightly over the insulation and secured. Two coats of asbestos cement, each ¼ in., were applied. A 16-gage sheet metal shell, fitted over the insulated vessel, guards the insulation against accidental mechanical damage.

Exhaust lines between the engines and the waste heat boilers are jacketed with engine cooling water, a practice which increases the heat exchange capacity of the waste heat boilers. A 1½-in. layer of 85% Magnesia pipe insulation was applied around the water jacket, and tied with 16-gage wire. A wrap of rosin-sized paper and an 8-oz. sewed canvas jacket constituted the finish. All insulation was painted with green fume-proof enamel.



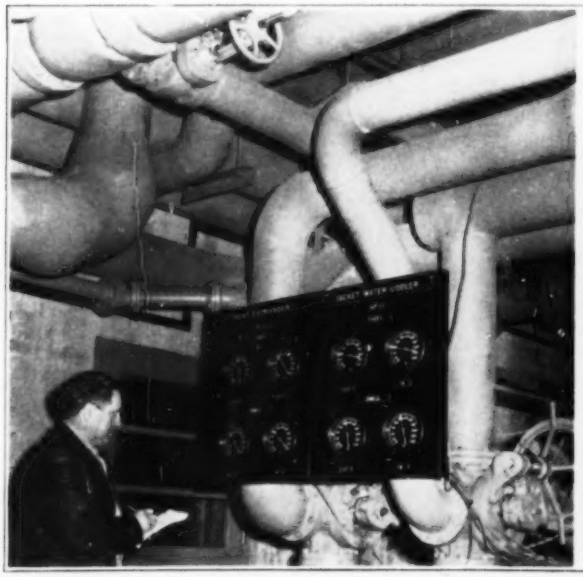

**INSULATION** detail of flanged connections

Hot water is circulated between the heat exchangers and the digester heating coils in 3 in. to 8 in. pipes. These were insulated with sectional 85% Magnesia. Sections were tied with 16-gage wire, and finished with rosin-sized paper, and a sewed 8-oz. canvas jacket.

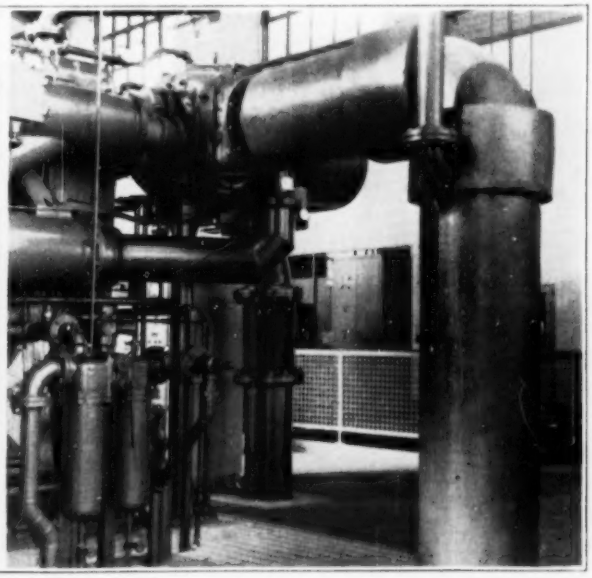
To permit ready removal of bolts, all flanges and fittings in the digester tank heating loop were insulated as follows: Piping insulation was stopped and tapered to a 45-degree angle about one inch ahead of the flange or fitting. Two short sections of insulation, having an outside diameter slightly greater than that of the flange or fitting, were fitted over the pipe insulation, on either side of flange or fitting. Sectional magnesia pipe insulation was then applied over this assembly, bridging the built-up insulation and covering the flange or fitting—(see diagram). Two ¼-in. layers of asbestos and hard finish cement and a pasted 8-oz. canvas jacket comprise the finish.

Valves were insulated with 85% Magnesia block and asbestos cement to a total thickness the same as that of the adjacent pipe insulation, then finished with a pasted jacket of 8-oz. canvas.

The Owl's Head Pollution Abatement Project as well as other projects of similar nature in New York City were designed, constructed and are operated under the supervision of Mr. Richard H. Gould, Director, Division of Sewage Disposal, one of the Divisions of the Department of Public Works of which Mr. F. H. Zurmuhlen is Commissioner.



**CONTROL** panel for heat exchanger and engine jacket water temperatures. All hot piping Magnesia insulated.



**HOT** exhaust line from engine to heat recovery boiler below is water-jacketed. Magnesia insulates jacket.

REPLACEMENT of corroded metal orifice plates in distributor arms with fiberglas-plastic plates.

# Plastic Plates Solve Sewage Plant Corrosion Problem

## Preventive Maintenance Program at Dallas, Texas, Treatment Plant Reveals Merits of Fiberglas-Plastic for Corrosive Sewage

*by* CLAYTON V. ING, JR., *Engineer, Plastic Engineering & Sales Corp., Fort Worth, Texas.*

IN late 1946, a supply of experimental plastic orifice plates for rotary filter distributors were furnished the Sewage Treatment Plant of Dallas, Texas, by the writer's company. They were installed on the distributor units used at this plant, with observations to be made at frequent intervals for corrosive effects and wear. The usual bronze-brass, or other metal plates which had been tried or were being used, had not proved satisfactory to the operators.

After inspections at intervals covering a period of about one year, the edges of the experimental plastic orifices were found to be as clean and sharp as the day of installation. Consequently, in the fall of 1947, one distributor unit was fully equipped with these plastic and glass fiber plates. After almost 4 years of observation, in 1950 all of the sixteen distributor units at the Dallas Treatment Plant were equipped with the fiberglas-plastic plates.

When we were first confronted with the problem of finding suitable material for these plates, several factors had to be taken into consideration before a material could be decided upon. Among these were flexural strength, compressive strength, brittleness, and resistance to mildly alkaline sewage. The pH of the sewage we knew to be normally about 7.25 with an alkalinity (methyl orange) of about 250. A low pressure laminate of fiberglas and a synthetic resin presented itself at the time to be the most logical solution, and it certainly has come up to expectations. We also could not lose sight of the fact that these plates had to be produced easily and cheaply.

### Properties of the Plastic Supplied

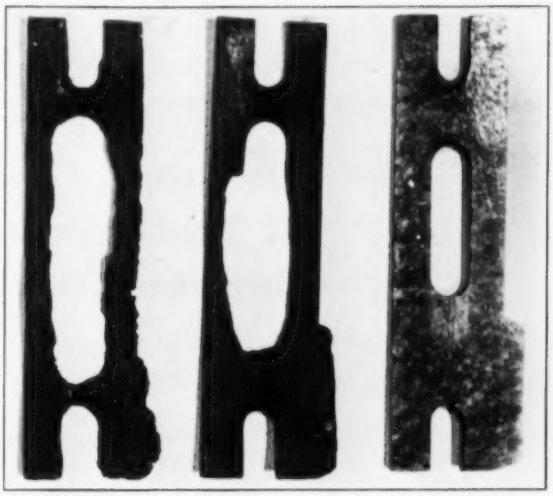
The accompanying table lists the physical and chemical properties of the fiberglas-plastic material used. Some of these properties have no bearing on the selec-

PROPERTIES OF FIBERGLAS-PLASTIC PLATES
(Values all based on material ⅛" thick.)

| | |
|---|---|
| Flexural Strength, psi | 20,500 |
| Rigidity (Youngs modulus x $10^6$) | 1.0 |
| Impact Strength, Izod (edgewise) | 21.0 |
| Tensile Strength, psi | 18,000 |
| Compressive Strength (e), psi | 15,500 |
| Hardness (Rockwell M) | 90 |
| Specific Gravity | 1.55 |
| Water Absorption % (ASTM) | .38 |
| Arc Resistance, sec. (ASTM) | 60 |
| Impact after 200 hrs. @ 125° C.% | 87. |
| Shrinkage after 200 hrs. @ 125° C.% | .3 |
| Rigidity modulus % @ 105° C. | 53 |
| Dielectric Strength (v/m) | 300w* |
| Effect of outdoor exposure | None |
| Effect of Hydrocarbons | None |
| Effect of Moderate Acids Generally | None |
| Effect of Chrome Plating Acids | None |
| Effect of Nickel Plating Acids | None |
| Effect of Floric Acid | Slight Attack |
| Effect of Acetone, Intermittent | None |
| Effect of Mild Alkali Cleaning Sol. | None |
| Effect of Alkalis Generally | Slight Attack |

*w — on 1/32" = 500 v/m

REMOVING old corroded orifice plates and deflectors, incident to installing new fiberglas-plastic orifice plates.



ORIFICE PLATES—Left, steel plate after several weeks; center, bronze plates after several months. Right, fiberglas-plastic plate after 2 years' service.

tion of material for the subject application. However, we have left them in for the benefit of the reader who might find other applications for the material.

On May 9, 1952, one of the distributor units at the Dallas plant was shut down for repairs and the accompanying pictures were made with the permission of Mr. Ben L. Grimes, Superintendent of Sewage Treatment at Dallas, Texas, who has authorized publication of this new adaptation of plastic material in sewage treatment.

These pictures, and the above mentioned facts, comprise evidence that corrosion has again been defeated through the use of plastics, and we feel that this material and similar materials will find many more applications in an age where engineers and operating personnel are becoming more and more conscious of the great toll taken by corrosion and are increasingly employing new methods and materials now available for use in combating this common enemy.

## Fluoridation Record at Sheboygan, Wis.

### Gains During 6.5 Years of Fluoridation Show Continuous Improvement

Fluoride treatment of the public water supply of Sheboygan, Wisconsin, was begun in February 1945. Each year since, in October, a survey of the condition of the teeth of school children has been conducted. The results in the accompanying table reveal a continuous improvement in the condition of the teeth of the children,

DENTAL SURVEY DATA—SHEBOYGAN, WIS. SCHOOLS

(Part I—Kindergarten Children—Deciduous Teeth)

| Year | Children Examined | % with no caries | D.M.F.* Teeth | % DFM Improvement since 1945 |
|---|---|---|---|---|
| 1945 | 416 | 20.4 % | 4.80 | (pre-fluoride) |
| 1946 | 520 | 26.9 % | 4.32 | 10.0% |
| 1947 | 521 | 29.17% | 4.09 | 14.8% |
| 1948 | 525 | 32.4 % | 3.46 | 27.9% |
| 1949 | 386 | 37.3 % | 2.90 | 39.6% |
| 1950 | 404 | 43.2 % | 2.58 | 46.2% |
| 1951 | 456 | 47.8 % | 2.22 | 53.7% |
| 1952 | 618 | 51.9 % | 1.99 | 58.5% |
| (Part II—7th, 8th, 9th grades—Permanent Teeth) | | | | |
| 1945 | 1877 | 2.77% | 8.54 | (pre-fluoride) |
| 1946 | 1590 | 2.61% | 8.09 | 5.28% |
| 1947 | 1642 | 3.28% | 7.27 | 14.8 % |
| 1948 | 1442 | 3.4 % | 6.92 | 19.0 % |
| 1949 | 1566 | 2.9 % | 7.00 | 18.0 % |
| 1950 | 1522 | 4.2 % | 6.67 | 21.9 % |
| 1951 | 1519 | 3.4 % | 6.54 | 23.4 % |
| 1952 | 1497 | 4.6 % | 6.00 | 29.7 % |

*D.M.F. is average number of Decayed, Missing (extracted), and filled teeth per child.

Fluoridation of the Sheboygan water supply at 1.0 part per million fluoride ion was started on February 25, 1946.

Dental Surveys are made in October of each year.

such improvement being in direct proportion to the per cent of the years of life of the children examined during which only fluoridated water was consumed.

Survey results for 4th Grade children are not available for the several years between 1945 and 1952 but the number examined in October, 1952, was 593. The average number of D.M.F. teeth per child was for all practical purposes the same as for the Kindergarten Group—namely, 1.96 per child as compared to 4.23 per child in the 7th Grade; 5.81 in the 8th Grade and 8.00 in the 9th Grade.

Of equal interest was the fact that the per cent of children examined and found to have had no decayed teeth were as follows for the several age groups.

| Grade | % With No Caries |
|---|---|
| 7-8-9th | 4.6 |
| 4th | 33.9 |
| Kindergarten | 51.9 |

In supplying these figures, released by the Wisconsin State Dept. of Health, J. C. Zeefelt, Supt. of Water at Sheboygan, states that since the lower age groups have had nothing but fluoridated water since birth these 1952 results probably represent the maximum improvement which can be expected in Sheboygan, but 1953 results will be awaited with interest.

## There IS a Water-Taster —But It's a Sad Life

The London Metropolitan Water Board employs a man who is reported to be the only member of his profession. He is a full-time water-taster.

S. Barwick, according to the London Daily Herald, has developed his taste to the point where he is able to identify the filtering process used and the area from which the water came. His method is similar to that used by tea-tasters and wine-tasters. He sips some of the water, rolls it around his tongue, then spits it out. He rarely swallows any.

Since he became a water-taster a number of years ago, Mr. Barwick has led a life of self-denial to keep his acumen at its peak. He neither smokes nor drinks. He eats a light lunch, and never touches highly seasoned foods.

Mr. Barwick, in common with fellow tasters in the wine and tea industry, has his favorite "brand." It is from the wells in Kent. He describes this product as "the champagne of waters. What vitality! What brilliance!"

# REPORT FROM ABROAD

## Chemical Oxidation Investigation at Huddersfield; Recirculation at Harrogate

*by* JOHN FINCH, *Manager, Sewage Disposal Dept. Rotherham, England*

CONTINUING the discussion of the Huddersfield experiments on the chemical oxidation of chemical trade wastes, the actual investigations involved the use of activated carbon, chlorine, bromine and ozone.

The experiments were carried out prior to those on true oxidation, and were indicative of the degree to which purification may be effected by adsorptive methods. Results showed every indication that quite a large proportion of polluting matter could be removed by adsorptive processes, and are considered to open a field for investigation of the use of less costly adsorbents.

Bromine and chlorine were shown to be valuable as a single stage treatment, and bromine was shown to reduce the oxygen consumed figures to a greater degree than chlorine, which finding corresponds with the known greater reactivity of the former in organic reactions. This series of experiments upon the use of halogens gave interesting figures in terms of reduction of oxygen consumed, but the author expresses the opinion that the possible production of toxic compounds in the Huddersfield sewage, by substitution of halogens into the molecular structure of the phenolic and other aromatic bodies present, might have deleterious effects upon subsequent biological processes.

The experiments carried out in the use of ozone, although employing simple apparatus, indicated the possibility of a reasonable reduction of oxygen consumed under alkaline conditions, and much more than may be attained by the process of simple aeration. It is thought that the unfortunate development of isocyanides, known to be extremely poisonous, might annul this accomplishment.

The effect upon the B.O.D. figures by ozonising appeared to be indecisive, but this may not be indicative of failure to render the samples more amenable to biological treatment.

> In his *Report From Aboard* which appeared in our October issue, Mr. Finch began a discussion of the need for chemical oxidation as a method for separate primary treatment of trade wastes from chemical works at Huddersfield. Certain of these wastes are very resistant to biological oxidation and, as a result, chemical oxidation studies were undertaken. These were planned to determine whether—
>
> ". . . Some reagent might be discovered which would economically break down or remove the constituents of the chemical sewage which resist biological oxidation. A complete purification process was not sought, but one which would render the sewage more amenable to secondary treatment."

These determinations were carried out very soon after the completion of ozonisation, and more satisfactory results might have been obtained if the samples had been allowed to stand for several hours before estimating B.O.D.

In considering the above series of investigations, it is observed that all lead to some reduction in the four hour oxygen consumed figure, but further work must be done to determine whether the reactions which occur may or may not give better purification in the biological treatment stages.

Mr. G. Taylor who has carried through these investigations under the guidance of his chief Dr. Goldthorpe, knew he was tackling a tough proposition when he commenced operations in the Huddersfield laboratory, and he is to be greatly admired for the commendable way in which he has set forth fully the results of his work.

### Recirculation Treatment at Harrogate

A most interesting meeting of the Institute of Sewage Purification was held at Harrogate a short time ago when a visit was made to the city's Northern Sewage Works to see the re-circulation scheme in operation there. After the visit to the works, a short meeting was held in the Harrogate Council Chamber to hear a contribution by Dr. Lloyd of the University of Leeds, on the subject of re-circulation with particular respect to the Harrogate plant.

Fairly strong contingents of alternating-double-filtration and re-circulation supporters were present at the meeting, and discussions on the topic of re-circulation waxed merrily.

The Borough of Harrogate is situated on a high tableland between the Rivers Wharfe and Nidd, in the West Riding of Yorkshire, and comprises an area of about 8,300 acres. A famous spa and health resort, Harrogate is noted for medicinal treatments and mineral springs.

The sewage works are of conventional design so far as the treatment of the normal dry weather flow of sewage is concerned, the sewage being almost wholly "domestic" in character and of "average" strength. The Northern works, with which we are concerned, drains a population of 26,000 with a dry weather flow of 1.25 mgd. The raw sewage normally has a B.O.D. of about 450 ppm, but frequently exceeds 550 ppm.

In the investigations under review, the expression "re-circulation" is to some extent a misnomer, because at Harrogate a portion of the settled percolating filter effluent is mixed with only part of the settled sewage. The resultant mixture is then treated at a relatively high rate on filters other than those producing the returned effluent—filters which in fact were originally provided for use as stormwater filters only. Levels are such that no pumping is necessary.

As a result of this innovation, not only is this plant able still to carry out its original function of dealing

with stormwater, should the occasion arise, but for the past eighteen months, the plant has treated 160 gallons per cube yard per day of settled sewage; or with a one-to-one mixture of settled percolating filter effluent, 320 gallons per cube yard per day. This operation has enabled the diversion of over 300,000 gallons per day of sewage from the Southern Works and sewerage system at Harrogate, which were overloaded and subject to flooding.

Mr. Fred Oliver, the manager of the Harrogate Sewage Works, has been very successful in his efforts to use available plant to the best advantage, and is now producing effluents which are said to be "the envy of sewage works managers and the delight of the rivers authority."

### Biological Population

Speaking of the general condition of the filters at the Harrogate Northern Works, in a discussion following the visit, Dr. L. Lloyd of the University of Leeds, stated:

"The surface of the filter medium held a good deal of the alga Phormidium and there were considerable patches of moss. Film growth was clearly very active and necessitated a very energetic grazing fauna if the filters were to be kept open. It was evident from my inspection that this fauna was abundant,, thriving and varied in species, differing in the last respect from heavily overloaded filters which tend to be restricted in variety of grazers. Achorutes was present and the usual filter worms were very abundant with the larger species prevalent just below the surface. Psychoda alternata and the chironomid Metriocnemus longitarsus were the most abundant flies. Both Spaniotoma minima and anisopus fenestralis were present. The shelled snail Limnaea peregra was unusually prevalent, especially near and in the mossy patches, and was no doubt playing an important part in keeping the filters open. The grazing fauna was thus complete, as filter faunas go, . . . and the filters had the appearance of being long established.

"A point that has struck me in regard to the Harrogate system gives some emphasis to the difference from the usual treatment. In the latter the filter is being fed with settled sewage relatively devoid of purifying bacteria and virtually devoid of grazing organisms, whereas when an admixture of settled filter effluent is added to settled sewage, the filter is being constantly seeded and reseeded with the purifying bacteria, and nitrifying must prevail through the whole depth of the filter; also, with the settled filter effluent there must also pass abundant eggs and juvenile forms of all the grazing organisms that occupy the parent filters. This happy combination which gives at one time the means of producing abundant active film and the means of keeping the film in check, at least in the warmer months, may be the secret of the efficiency of these four feet deep filters so heavily loaded. . . ."

Dr. Lloyd went on to describe the re-circulation system as virtually an "activated" system—in effect an activated sludge system without the sludge—and this may be a fair description of the process in which settled filter effluent, circulating through a percolating filter, carries with it the correct proportionate quantity of settled sewage for purification.

### Filtration Efficiency

Dr. W. Watson of Keighley, who has had very considerable experience in re-circulation, and who is one of the authorities in this country on this method of treatment, opened the discussion on Dr. Lloyd's comments and observations attaching to the process.

In a thoroughly sound discourse on the practice and theories of re-circulation, he agreed with most of the opinions and findings of Dr. Lloyd, and gave instances of some of his own work in the field. However, he disagreed with Dr. Lloyd on the matter of nitrification prevailing throughout the whole of the depth of the filter. He pointed out it had been his experience that, in many instances, one of the first effects of distributing settled percolating filter effluent in admixture with settled sewage on the top of a percolating filter was a bio-chemical change. This occurred in the form of rapid removal of any oxygen that might be present in the effluent and, in a very similar manner, any nitrate that might also be present in the diluent was rapidly used up in the top few inches of the filter. Dr. Watson then observed that after this initial stage in the re-circulation process, nitrification might or might not occur at a later stage in the filter, depending upon a variety of factors such as rate of loading applied to the filter.

Incidentally, in point of fact, the type of reaction detailed by Dr. Watson does actually take place in one particular section of my own sewage treatment plant at Rotherham.

### Recirculation Efficiency

The performance of a very old plant of the Sheffield system of bio-aeration (thirty years old), was improved out of all recognition by the inclusion of settled percolating filter effluent along with the settled sewage in the feed to the plant. The percolating filter effluent of a not-too-good character contained varying proportions of nitrates and nitrites along with some dissolved oxygen, and it was noticed that within a very short time after the settled filter effluent entered the aeration tank (along with the settled sewage) the nitrate had been reduced.

Whilst this form of re-circulation, which was put into operation in 1935, enabled the bio-aeration plant to deal with considerable more settled sewage, and to produce an effluent far superior to anything produced prior to the change, it never was possible to produce a nitrified bio-aeration effluent—as distinct from the filter re-circulation processes in which this desirable step is achieved—but nevertheless the effluents were considered very satisfactory by the river authority.

Reverting to the discussion on Dr. Lloyd's contribution, Dr. J. Nixon, at one time of the Huddersfield Sewage Department and now of the Yorkshire Ouse River Board, emphasized what he considered to be one of the most important advantages of the re-circulation of filter effluent on percolating filters: the ability also to circulate scouring organisms on the top of the filter and keep the filter media clean and open.

Interestingly enough, it was at Harrogate (in 1937 at the Summer Conference of the Institute of Sewage Purification) that H. N. Jenks of the U.S.A. presented the first paper to be received in Great Britain on what was considered at that time to be the last word in percolating filter performance — re-circulation. At this meeting and afterwards there was a good deal of criticism and adverse comment on the paper. However, all this has now been straightened out and we have the instance of a paper given at Harrogate in 1937, the benefits of which are now being enjoyed by that same town in the year 1952!

The *Report from Abroad* will continue to present topics and opinions of timely interest. Mr. Finch is Chairman of the North Eastern Branch of the Institute of Sewage Purification, and is a frequent contributor to British technical journals. He will welcome the opportunity of replying personally to readers of *Water and Sewage Works* who have questions or require additional information regarding the subjects discussed.—The Editors.

# THE EDITOR'S COMMENTS

## Research—Does it Pay?

During the past fifty years notable advances have been made in sewage-treatment processes. Much of this progress has been the result of rewarding research work. Unfortunately, however, after a sewage plant is completed, interest often lags, operating appropriations are inadequate and research work is discontinued.

Due to the continuous growth of many American cities, their sewage-treatment works often become overloaded within five, ten or fifteen years after they are completed. Such being the case, it is good business at every plant of any magnitude to formulate a research program for developing new processes and investigating some of the unsolved problems that exist today.

No sewage-works operator is using his technical staff to the best advantage if their entire time is devoted to making routine analyses and compiling records. In many instances these analyses and records are filed away and serve little useful purpose. At least a part of the time of chemists and bacteriologists should be spent in studying problems and seeking improvements in methods and equipment.

Municipalities can well afford to take a lesson from industry. The phenomenal advances made by chemical, aeronautic, automotive, electrical and other industries in the past half century have been due to the far-sighted policy of stimulating and promoting research. The appropriations for research by private industry have in many instances been quite liberal; the returns have paid a hundred fold. That which has been of inestimable value to private enterprise should be of equal worth to public undertakings.

Where sewage treatment works of intermediate or large size are being planned and built, they should be provided with the facilities for conducting research. For example, the equipment for doing bacteriological and chemical work should be provided, and pilot-plant treatment units such as activated-sludge aeration tanks, trickling filters, sludge digestion tanks, etc., should be made available. When new plants are put into operation, one or more biologists and chemists, the number to depend upon the size of the plant, should be employed to do research work on a part-time if not full-time basis.

Many sewage-treatment problems remain unsolved. Much improvement is still possible in the design of settling tanks. Problems that need concentrated study are the relative merits of circular and rectangular tanks, the most suitable types of tank inlets and outlets, the proper location and length of outlet weirs and the most satisfactory relationship between the length, the width and the depth of rectangular tanks. Much remains to be learned regarding the biological, chemical, physio-chemical and the biochemical process in trickling filters and the activated-sludge process. What are the possibilities of further treating sewage effluents by straining through fine mesh wire cloth or mechanical sand filters? The biology of sludge digestion is almost a virgin field.

Many problems relating to sludge filtration remain unsolved. The solution of these and kindred problems serve as a challenge to the research worker and the municipal administrator.—C. E. Keefer

## Beware the "Ides" of January and February

Predicting a severe winter ahead, our weather prophet, retired "daddy" of the Gillette Publications—H. P. (for horse-power) Gillette—early last October submitted his latest article on weather cycles and the weather in the offing. It was published in our December issue under the title, *"A Severe Winter Ahead!"*

Based on his studies of the spacing of tree-rings, the thickness of silt layers (technically, varves) in sedimentary rock strata; and, more recently, observation of the effects of the approaching heliocentric conjunctions of two planets (Saturn and Neptune in this instance, due February 18, 1953). Mr. Gillette, with the courage of his convictions, predicted: "In consequence, a cold winter with heavy precipitation is to be expected."

Each time that we publish "H. P.'s" predictions of the weather ahead, we do so with the undercurrent of feeling that this time may be the one when he could be wrong—no aspersion, just a feeling based on common knowledge of what happens in the case of many long-range weather predictions.

Taking a look back at his earlier predictions of the weather to come, Mr. Gillette has hit the nail on the head closely enough in the past to say that he has been at least 90% correct. And, taking a look at the weather record for this winter, he has so far been dead right.

Since receiving his article, predicting wet and cold weather for the winter ahead, rains in drenching proportions and early blizzards have been experienced in many parts of the country. Abnormally early, bitter cold has gripped the states between the Appalachians and the Pacific Coast. Rains turned to snow as an early winter blizzard enveloped the Mid-West just before Thanksgiving Day. Out in parts of Montana and Wyoming, even before winter had officially arrived, temperatures plummeted to 31 below zero. In Minnesota, Kansas and the Dakotas, early below-zero weather was experienced. According to "Newsweek" magazine, the death toll was 38 or more. Winds blew up to 82 miles per hour and huge snow drifts stalled crack transcontinental and Pacific Coast trains, and marooned hundreds of motorists on highways. In Florida, the predictions of old-line Democrats whistling in the dark, that "it would be a cold-cold day when Florida goes Republican" came too realistically true for the comfort of shivering Floridians. It was under 30 in parts of Florida on the day of the official counting of the ballots that put Florida in the Republican column.

In Minneapolis traffic was wrecked by an 8-inch fall of heavy, wet snow that froze hard and solid. Then, too, even the Southeast was not spared when a not-to-be-expected heavy and wet snow of 10 inches or more collapsed roofs, played havoc with air, rail and highway traffic between Chattanooga, Tenn., and Pulaski, Va.

In Milwaukee, full hurricane warnings were posted for the first time in some years and 10 Great Lakes steamers were forced to take shelter. Not America alone, but Europe, also has been experiencing extraordinary weather—particularly England.

All in all, we would say that "H. P.'s" predictions have so far been again close to 100% for the winter, but winter has only begun.

Water Works Men: Beware "the ides" of January and February and be prepared.

L. H. Enslow

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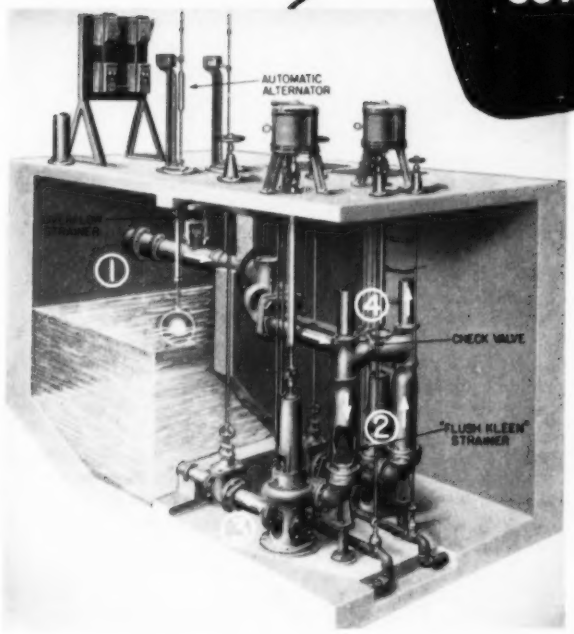


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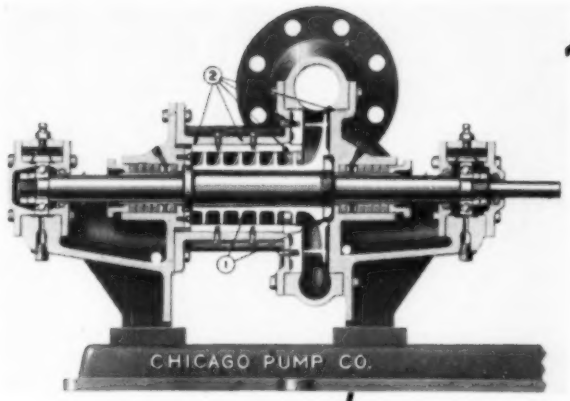


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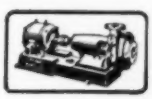

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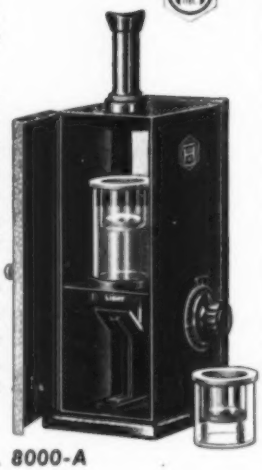

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# Meetings Scheduled

Jan. 20, 1953—New York, N.Y. *(Park Sheraton Hotel)*
NEW YORK SECTION A.W.W.A. (Annual Winter Luncheon Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th Street, New York, N.Y.

Jan. 22—Boston, Mass. *(Hotel Statler)*
NEW ENGLAND WATER WORKS ASS'N. Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Jan. 22-23—New York, N.Y. *(Hotel New Yorker)*
NEW YORK STATE SEWAGE WORKS ASSOCIATION. Sec'y, R. C. Sweeney, 21 No. Broadway, White Plains, N.Y.

Feb. 10-11—Portland, Me.
MAINE WATER UTILITIES ASSOCIATION. (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Feb. 11-13—Indianapolis, Ind. *(Lincoln Hotel)*
INDIANA SECTION A.W.W.A. Sec'y, Geo. G. Fassnacht, 366 Good Ave., Indianapolis 19, Ind.

Feb. 17—Newark, N.J. *(Essex House)*
NEW JERSEY SECTION A.W.W.A. (Winter Luncheon Meeting). Sec'y, C. B. Tygert, Box 178, Newark, N.J.

Feb. 19—Boston, Mass. *(Hotel Statler)*
NEW ENGLAND WATER WORKS ASS'N. Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Feb. 19-20—Columbus, Ohio *(Ohio State Univ. Campus)*
OHIO WATER CLINIC. Director, Assoc. Prof. Kenneth W. Cosens, Ohio State University, Columbus, Ohio.

Feb. 26-28—Dallas, Texas *(Baker Hotel)*
AMERICAN CONCRETE PIPE ASSOCIATION. (45th Annual Convention). Director, Howard F. Peckworth, 228 N. LaSalle St., Chicago, Ill.

Mar. 8-12—College Station, Texas *(Texas A. & M. College)*
TEXAS WATER WORKS & SEWERAGE ASSOCIATION. (Annual Meeting.) Sec'y, V. M. Ehlers, State Dept. of Health, Austin, Texas.

Mar. 11-13—Atlantic City, N.J. *(Traymore Hotel)*
NEW JERSEY SEWAGE & IND. WASTES ASSOCIATION. Sec'y, M. S. Kachorsky, Box 766, Manville, N.J.

Mar. 16-18—Little Rock, Ark. *(Robinson Auditorium)*
ARKANSAS WATER & SEWAGE CONFERENCE. Sec'y, Dr. Harrison Hale, Southern State College, Magnolia, Ark.

Mar. 18-20—Chicago, Ill. *(LaSalle Hotel)*
ILLINOIS SECTION A.W.W.A. Sec'y, J. Leslie Hart, 122 S. Michigan Avenue, Chicago, Ill.

Mar. 19—Boston, Mass. *(Hotel Statler)*
NEW ENGLAND SECTION A.W.W.A. Sec'y, G. G. Bogren, 14 Beacon Street, Boston, Mass.

Mar. 19—Boston, Mass. *(Hotel Statler)*
NEW ENGLAND WATER WORKS ASS'N. Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Mar. 19-20—Chapel Hill, N.C. *(Univ. of No. Carolina)*
SECOND SOUTHERN MUNICIPAL & IND. WASTE CONFERENCE. (Sponsored by Duke Univ., Univ. of N.C. & N.C. State College.) Arrangements Chmn. Dr. Daniel A. Okun, Assoc. Prof. of San. Eng., Univ. of North Carolina, Chapel Hill, N.C.

Mar. 23-25—Macon, Ga. *(Hotel Dempsey)*
SOUTHEASTERN SECTION A.W.W.A. Sec'y, T. A. Kolb, Wade Hampton Bldg., Columbia, Ga.

Apr. 2-4—Spartanburg, S.C. *(Clemson College)*
SOUTH CAROLINA WATER & SEWAGE WORKS ASSOCIATION. Sec'y, W. T. Linton, Wade Hampton Bldg., Columbia, S.C.

Apr. 6-8—Buffalo, N.Y. *(Hotel Statler)*
CANADIAN SECTION A.W.W.A. Sec'y, Dr. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

Apr. 15—Livermore Falls, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Apr. 16-17—Lincoln, Neb. *(Cornhusker Hotel)*
NEBRASKA SECTION A.W.W.A. Sec'y, E. Bruce Meier, Dept. Civil Eng., Univ. of Nebraska, Lincoln, Neb.

Apr. 16-17—Elmira, N.Y. *(Mark Twain Hotel)*
NEW YORK SECTION A.W.W.A. (Spring Meeting). Sec'y, Rollo K. Blanchard, 50 West 50th Street, N. Y. 20, N.Y.

Apr. 16-18—Chandler, Ariz. *(Hotel San Marcos)*
ARIZONA SECTION A.W.W.A. Sec'y, M. V. Ellis, 46 W. Encanto Blvd., Phoenix, Ariz.

Apr. 16-18—Portland, Ore. *(Multnomah Hotel)*
PACIFIC NORTHWEST SECTION A.W.W.A. Sec'y, O. P. Newman, Boise Water Corp., Boise, Idaho.

Apr. 22-24—Wichita, Kans. *(Hotel Broadview)*
KANSAS SECTION A.W.W.A. Sec'y, Harry W. Badley, 119 W. Cloud, Salina, Kans.

Apr. 22-24—Wichita, Kans. *(Hotel Broadview)*
KANSAS SEWAGE & IND. WASTES ASSOCIATION. Sec'y, D. F. Metzler, Marvin Hall, Univ. of Kansas, Lawrence, Kans.

Apr. 22-25—Santa Barbara, Calif. *(Mar Monte Hotel)*
CALIFORNIA SEWAGE & IND. WASTES ASSOCIATION. Sec'y, Sam A. Weed, Room 315, City Hall, Oakland 18, Calif.

Apr. 23-25—Chandler, Ariz. *(San Marco Hotel)*
ARIZONA SEWAGE & WATER WORKS ASSOCIATION. Sec'y, M. V. Ellis, Sewage Treatment Plant, Phoenix, Ariz.

Apr. 23—Kalispell, Mont. *(Kalispell Hotel)*
MONTANA SEWAGE WORKS ASSOCIATION. Sec'y, Harvey W. Taylor, State Board of Health, Helena, Mont.

Apr. 24-25—Kalispell, Mont. *(Kalispell Hotel)*
MONTANA SECTION A.W.W.A. Sec'y, A. W. Clarkson, State Board of Health, Helena, Mont.

May 10-15—Grand Rapids, Mich. *(Exhibits and Technical Sessions—Auditorium. Hotels—Various*)*
AMERICAN WATER WORKS ASSOCIATION (73rd Annual Convention). Exec.-Sec'y, Harry E. Jordan, 521 Fifth Ave., New York 17, N.Y. *(*Apply to A.W.W.A. Headquarters Office for Reservations)*

June 3-5—Peoria, Ill. *(Hotel Pere Marquette)*
CENTRAL STATES SEWAGE & IND. WASTES ASSN. Sec'y, A. P. Troemper, Ill. Water Board, Springfield, Ill.

June 10—Bath, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

June 17—Martinsville, N.J. *(Martinsville Inn)*
NEW JERSEY SECTION A.W.W.A. (Summer Outing & Inspection of Johns-Manville Research Center, Finderne, N.J.—Luncheon at Inn). Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

June 17-19—Hershey, Pa. *(Hotel Hershey)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, Dept. of Health, Greensburg, Pa.

June 18—York Harbor, Me. *(Marshall House)*
NEW ENGLAND WATER WORKS ASSOCIATION (June Conference). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

June 29-July 3—Atlantic City, N.J. *(Chalfonte Hadden Hall)*
AMERICAN SOCIETY FOR TESTING MATEPIALS. Sec'y, R. E. Hess, 1916 Race St., Philadelphia, Pa.

Aug. 12—Sanford, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Aug. 24-26—State College, Pa.
PENNSYLVANIA WATER WORKS OPERATORS ASSN. Sec'y, R. R. Kountz, Penna. State College, State College, Pa.

Aug. 26-28—State College, Pa.
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

*(Continued on page 82)*


NEW DEVELOPMENT INCREASES
AERATION
EFFICIENCY

Increase the oxygen content in:
- trickling filter feed
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- waste liquids with depleted oxygen

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BULKLEY-DUNTON
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- introduces atmospheric air up to 3% by volume

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PROCESSES, INC.
295 Madison Avenue • New York 17, N. Y.

## Meetings Scheduled

*(Continued from page 81)*

Sept. 1-5—Winnipeg, Can.
MINNESOTA SECTION A.W.W.A. Sec'y, L. N. Thompson, Water Department, St. Paul 2, Minn.

Sept. 10-11—Lake Placid, N.Y. *(Lake Placid Club)*
NEW YORK SECTION A.W.W.A. Sec'y, R. K. Blanchard, 50 West 50 St., New York, N.Y.

Sept. 10-11—Cleveland, O. *(Hotel Cleveland)*
OHIO SECTION A.W.W.A. Sec'y, M. E. Druley, Dayton Power & Light Co., Wilmington, Ohio.

Sept. 21-23—Owensboro, Ky. *(Hotel Quensboro)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, J. W. Finney, 420 6th Ave. N., Nashville, Tenn.

Sept. 22-24—Milwaukee, Wis. *(Hotel Pfister)*
WISCONSIN SECTION A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison 3, Wis.

Sept. 28-30—Poland Spring, Me. *(Poland Spring House)*
NEW ENGLAND WATER WORKS ASSOCIATION. (72nd Annual Convention). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Oct. 13-16—Miami, Fla. *(Municipal Auditorium—Bayfront Park)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN. (26th Annual Meeting). Exec.-Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(joint Meeting with)
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION, Sec'y, D. P. Schiesswohl, P.O. Box 210, Jacksonville, Fla.

Oct. 14—Rumsford, Me.
MAINE WATER UTILITIES ASSOCIATION (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Oct. 14-16—Waterloo, Iowa *(Hotel Russell Lamson)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

Oct. 18-21—Houston, Tex. *(Rice Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Auditorium, Little Rock, Ark.

Oct. 19-24—New York, N.Y.
AMERICAN SOCIETY OF CIVIL ENGINEERS (Annual Meeting). Sec'y, Wm. N. Carey, 33 W. 29 Street, New York 18, N.Y.

Oct. 20-23—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 22-24—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 27-30—San Francisco, Calif. *(Palace Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, J. C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

Oct. 28-30—Wilmington, Del. *(Hotel DuPont)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, C. J. Lauter, 6955 33rd Street, Washington 15, D.C.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

Nov. 8-13—New York, N.Y.
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y, Mrs. W. R. Walsh, A.P.H.A., 1790 Broadway, New York, N.Y.

Dec. 9—Waterville, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.


# This is worth looking into

We make CAST IRON PIPE . . . built to last for generations . . . in any size from 2" to 96" with all types of joints. For 97 years, the WF trade mark has meant "Durable Pipe," made with proper crushing, beam, shock and bursting properties.

It's the kind of pipe that stays in service . . . rugged, strong, economical . . . because you can bury it and forget it! Miles upon miles have been underground for almost a century and *still* in good condition when excavated.

- Bell & Spigot Pipe
- Short Body Bell & Spigot Specials
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- Flexible Joint Pipe
- Cast Iron Rolls
- Cylinders
- Pipe and Fittings Also Available In Heat Resistant and Corrosive Resistant Meehanite Metals

Also manufacturers of jobbing castings through 20 tons in weight in Alloy Iron, Grey Iron and Meehanite Metals

*Specify*

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**CAST IRON PIPE...**

***AND BE SURE!***

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**PLANTS:** Phillipsburg, N. J. Everett, Mass.
**WARREN PIPE CO. OF MASS. INC. 75 FEDERAL ST. BOSTON, MASS.**
*97 Years of Continuous Service*

## A Warning!

In our November issue we printed an article by Jas. G. Carns and Martin E. Flentje of the American Water Works Service Co. This article related "Experiences With Plastic Tubing for Water Service Installations," which experience involved several thousand feet of the plastic tubing installed under various conditions.

Since the publication of their article certain important observations lead Messrs. Carns and Flentje to issue the following warning to any who may be contemplating installations of plastic service pipe or tubing. A serious weakness has been observed in the tubing clamps.

The authors advise that recent examination of some of the clamps used with plastic services installed reveal that parts of these clamps were not made of stainless steel. These nonstainless parts have been corroding at a rate to give concern. The stainless steel clamp section itself was untouched. As a result of these findings their company has temporarily discontinued further installations until either all-stainless clamps are made available or some other suitable method of clamping can be provided.

Messrs. Carns and Flentje also advise that since the article was written the question of toxicity *has* been raised by several Health Departments, and that this question is now the subject of investigation in the laboratories of The National Sanitation Foundation at the University of Michigan.

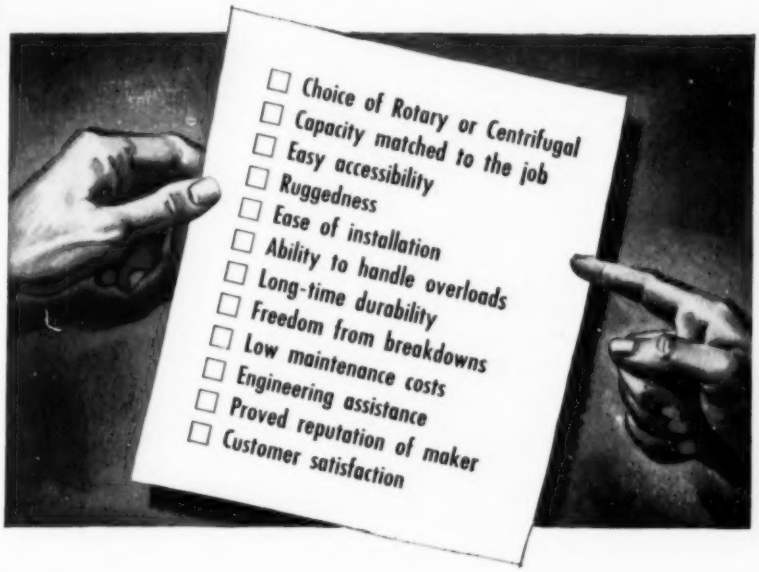
Messrs. Carns and Flentje request re-emphasis of their stated opinion that the use of plastic tubing in water works must still be considered as experimental at this juncture. They plan to publish further results of their experiences and investigations as they become available.

We hope that this word of warning receives the same degree of attention as apparently did the subject article by Messrs. Carns and Flentje in our November, 1952, issue.

## Indianapolis Water Co. Sold to Texas Buyer

Harold S. Schutt, president of the Indianapolis Water Co., speaking for the Geist interests, which has long been the majority owner of this well


# BEFORE BUYING *any* BLOWER COMPARE THESE ESSENTIALS


☐ Choice of Rotary or Centrifugal
☐ Capacity matched to the job
☐ Easy accessibility
☐ Ruggedness
☐ Ease of installation
☐ Ability to handle overloads
☐ Long-time durability
☐ Freedom from breakdowns
☐ Low maintenance costs
☐ Engineering assistance
☐ Proved reputation of maker
☐ Customer satisfaction

When operation of sewage treatment plants depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in sewage treatment applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Mount Avenue, Connersville, Indiana

**Motor-driven, 16,000 cfm Centrifugal Blower in large metropolitan sewage treatment plant. Three high-capacity R-C Rotary Blowers are also included in this installation.**

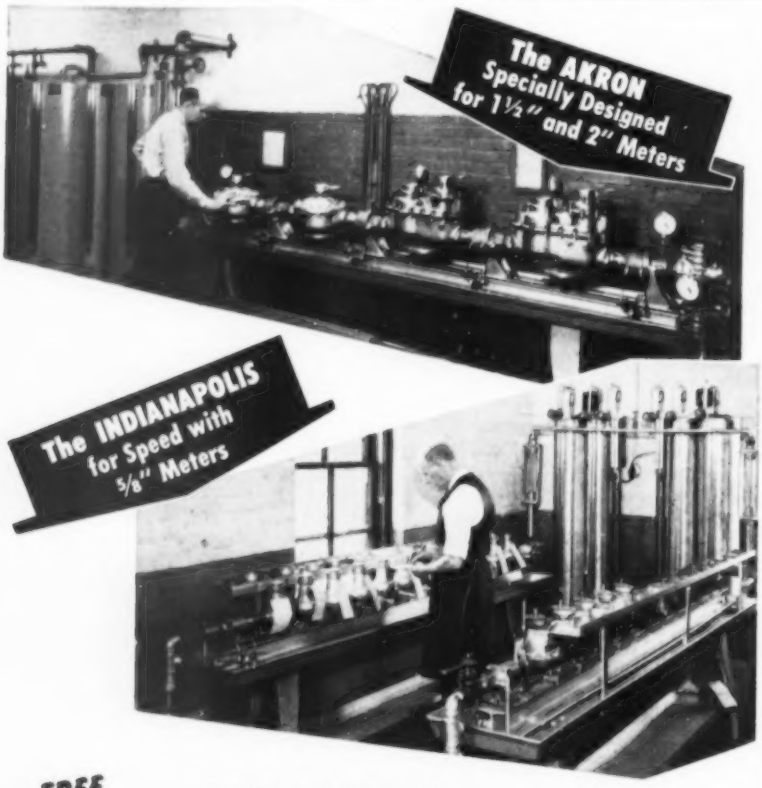
REG. U. S. PAT. OFF.
ROOTS-CONNERSVILLE BLOWER
BLOWER BUILDERS SINCE 1854
A DIVISION OF DRESSER INDUSTRIES, INC.

known and locally liked water utility, has announced the sale of the controlling interests in the Company to Murchison Brothers of Dallas, Texas.

Murchison Bros. is an old and well known firm which has long been prominent in public utilities, oil, gas and other industries of the Southwest.

President Schutt, in making the announcement of the sale negotiations, advised the people of Indianapolis that Murchison Bros. had assured him that there would be no change in policy, methods or personnel of the Company. Thus, the people of Indianapolis will continue to be served by the same proficient staff, and with the same foresighted planning in maintenance of the adequate service which has characterized the Indianapolis Water Co. for so many years.

Ed. Note: An aside on the above will indicate the regard of the people of Indianapolis for their Water Utility. A few years ago when there was a wave of buying out of privately owned water works by municipalities, the voters in Indianapolis turned "thumbs down" on the balloted proposal that the Water Company be purchased and operated by the City. Evidence enough that the service rendered, rates charged, and regard of the public for the Water Company and its management, was all to the good in Indianapolis.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FORD SPECIAL
METER TESTING BENCHES
*offer High Efficiency*

In many large meter shops the volume of testing justifies special equipment. The possibilities are worth investigating. Write for information.

THE FORD METER BOX COMPANY, INC.
Wabash, Indiana
FOR BETTER WATER SERVICES
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# NEW WATER & SEWAGE BOOKS

**Handbook of Applied Hydraulics.** Second Ed. Calvin Victor Davis, Editor-in-Chief. (McGraw-Hill Book Co., Inc., New Rork, N.Y. $15.00)

A comprehensive manual of 1272 pages, supplying a wealth of reference material on all phases of hydraulic engineering. Deals mainly with the practical aspects of hydrology, water supply, sewerage, water power, and hydraulic structures. Hundreds of illustrations, diagrams, tables, and problem-solving pointers.

* * *

**Handbook of Engineering Fundamentals.** Second Edition. Ovid W. Esbach, Editor. (John Wiley & Sons, Inc., New York, N.Y. $10.00)

A staff of 39 specialists contributed to the review and revision of the first edition of this valuable handbook. There are fourteen sections designed to present ready reference to basic ideas of applied science and mathematics, and to the subject of engineering fundamentals. The index is very comprehensive.

* * *

**Fluid Flow in Pipes.** By Clifford H. McClain. (The Industrial Press, New York, N.Y. $3.00)

Explains in simple terms the fundamental physical processes involved in gas and liquid flow in ducts. Applications of principles described are related to problems in piping and duct work, giving the necessary calculations.

* * *

**Statistical Methods for Chemists.** By W. J. Youden. (John Wiley & Sons, Inc., New York, N.Y. $3.25)

The first American book on statistics for chemists. Unusual in approach (its absence of statistical theory and proof), but useful in presenting techniques which apply to chemists' interpretation of data.

* * *

**Man and Epidemics.** By C.-E. A. Winslow. (Princeton University Press, Princeton, N.J. $4.00)

An account for the general reader of modern engineering practices and scientific methods of control that

make it possible to draw an ample flow of pure water from the faucet, to enjoy a milk supply of safe and sanitary quality, and to eat food without fear of infection.

* * *

**Quantitative Analysis.** By Harvey Diehl and G. Frederick Smith. (John Wiley & Sons, Inc., New York, N.Y.)

For chemists who need up-to-date discussions of new methods such as colorimetry, oxidation-reduction titrations, and the versene method of determining the hardness of water.

## San Francisco Sewage Plant Boasts Its Own Elevated Tank

**Overhead Filling a Unique Feature**

Some months ago we printed a brief story of the elevated tank at Toronto's new Sewage Treatment Plant, erected to supply pressure water for grit washing and other uses where potable water is not required. The tank is supplied with raw water from Ashbridge Bay.

There appears to be a trend toward the provision of elevated tanks at the larger sewage treatment plants. The accompanying picture is the 15,000 gallon tank on a 98 ft. tower which serves the Southeast Treatment Plant of San Francisco. In this instance the tank is connected to the water mains of San Francisco and fills by gravity during off-peak hours of


# KENNEDY A.W.W.A. GATE VALVES

**JOB-FITTED**

**...for a wide range of water works requirements**

KENNEDY Fig. 56, A.W.W.A. Standard Double-Disc Gate Valve.

Every KENNEDY A.W.W.A. valve is JOB-FITTED...specially designed and engineered for the job it has to do. Conforming to A.W.W.A. standards in every detail, these Kennedy valves offer many extra-value features . . . one being the iron itself, which is 50% stronger than ordinary cast-iron . . . to keep them on the job year in and year out.

KENNEDY manufactures a most complete line of water works valves . . . in sizes from 2" to 60" . . . non-rising stem and outside-screw-and-yoke types . . . with a wide variety of gearing arrangements, controls, accessories and end connections available.

Standardize your community on KENNEDY valves . . . and fire hydrants . . . and you get dependable, trouble-free service that means greater economy and protection for decades ahead!

WRITE FOR BULLETIN 106

THE KENNEDY VALVE MFG. CO. • ELMIRA, N.Y.

Est. 1877

VALVES • PIPE FITTINGS • FIRE HYDRANTS

water use by takers in the vicinity of the treatment plant.

The tank, installed by Chicago Bridge & Iron Co., has two unique design features. To preclude possible back-syphonage of water from the tank into the city water mains the tank fills through an overhead filling line that runs up along one of the tower legs and enters the tank over the top. The center riser pipe serves only as an outlet, supplying water to the plant piping system which has no physical connection with the city's mains. Water for domestic use around the plant is taken off from the 12″ riser through a 4″ riser which is connected to the center riser at a point 65 ft. up. This scheme was resorted to as a safety precaution against contamination of the water used for drinking or cooking and in the wash rooms of the plant.

Chief uses of the water, which the tank supplies under constant pressure and at high rates whenever demanded, is for general flushing and washing down operations, scum sprays in the settling tanks, and other odd uses.

The Southeast plant was designed by the late Clyde C. Kennedy, San Francisco consulting engineer. Superintendent of the plant is Benjamin Benas, Engr. of Sewage Disposal.

## Industrial Waste Conference to Consider Southern Problems

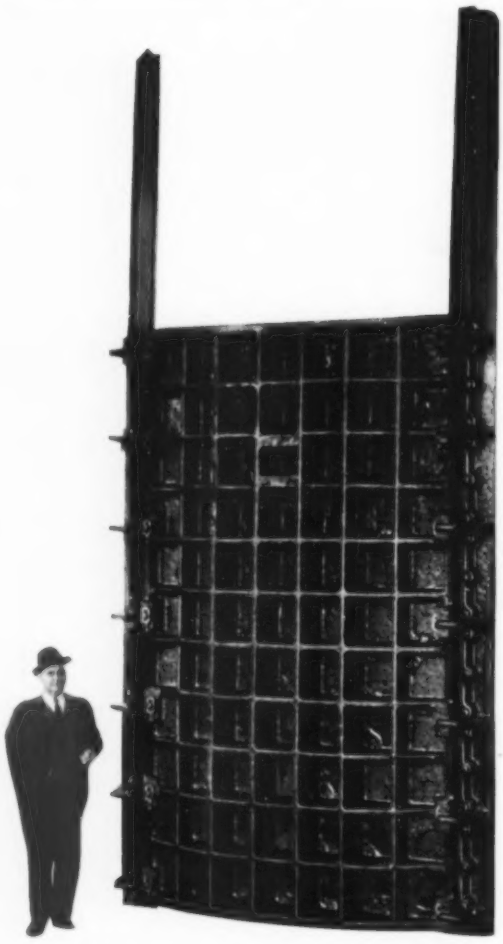
The Southern Association of Science and Industry has announced that a special two-day regional conference will be held early in 1953 to cope with problems of air and stream pollution. The conference will bring together experts in all phases of industrial waste disposal and utilization to work out a sound program for the region's future guidance.

"Clear air and clean streams are a great Southern resource—we want to use them without abusing them," SASI President James F. Crist said in announcing plans for the conference. "Our objective is to continue the South's rapid industrial development without accumulating serious pollution problems similar to those that now exist in regions which were industrialized without adequate planning," he said.

The conference to be held in New Orleans on April 20 and 21 will focus attention on economic, technical, and social aspects of industrial wastes handling. Industrial leaders, government officials, research experts, and community representatives will participate. All sessions will be open to the public. Speakers will include some of the nation's top men in the industrial wastes field.

To insure representation of major interested groups throughout the 14 Southern states, SASI has formed an industrial wastes advisory committee.

The SASI is a non-profit, nonpolitical organization founded in 1941. It maintains a central research office in Atlanta under Director H. M. Conway, Jr.

**FILER & STOWELL SLUICE GATES**

**are built to stand long trouble free service. Amply proportioned for all stresses of shipment, erection and operation. They may be obtained with manual, hydraulic cylinder or motor operating controls.**

**THE FILER & STOWELL COMPANY**
**MILWAUKEE 7, WISC.**

"Yeah—happens every time the city uses too much of those softener chemicals in the water."

## Corrosion Resistant Linings

101

The Atlas Mineral Products Company, Mertztown, Penna., has announced the commercial availability of a new type plasticized polyvinyl chloride sheet to supplement its present series of ATLASTAVON Linings.

The new product will be designated ATLASTAVON 20 and will be installed by approved applicators, as well as at the Mertztown and Houston Lining Shops. This product is resistant to alkalies, corrosive salts and most acids including nitric and chromic acids. It is applied by a new technique developed as a result of over three years of research.

## Link-Belt's New Colmar Plant the 17th for this Company

**Experimental Sewage Treatment Plant a Feature**

On December 3rd, representatives of the technical and business paper press were guests of the Link-Belt Co. at its newest of seventeen plants now operated by this company, which dates back to 1880 when it was founded in Chicago as the Link-Belt Machinery Co. Some eight years later (1888) the Link-Belt Engineering Co. was founded in Philadelphia. It was in 1906 that the present Link-Belt Co. was formed through merger of the two Link-Belt Cos. and Ewart Mfg. Co. of Indianapolis, founded 1875.

The newest of Link-Belt's seventeen plants, located at Colmar, Pa., is the joy and pride of the company's

**STEVENS**

**TYPE B-FT RECORDER PROVIDES PERMANENT DATA ON SEWAGE FLOW**

**At this modern sewage treatment plant in Dallas, Oregon, the STEVENS Type B-FT Recorder provides a permanent graphic record of flow in million gallons per day (range 0-6 MGD) and totalizes the volume in gallons. The STEVENS Recorder is mounted over a stilling well connected to a 9" throat width Parshall flume.**

**record flow accurately . . . automatically**

There is good reason why modern municipal sewage and industrial waste measuring installations use the STEVENS Type B Recorder. It may be wall, pedestal or panel mounted, is easily operated and will give a lifetime of accurate, trouble-free service. This Recorder uses a circular chart which makes one revolution per day or per seven days, as specified, while the pen swings in an arc around an external center—the combined movements thereby producing a graph of the rate of flow (or head) against time. Volume is indicated on a counter-type totalizer. Accuracy of the registration is limited only by the accuracy of the rating to which the totalizer is set. Flow or head (or both) may be indicated on a scale clearly visible through a large glass port.

**RECORDS FLOW**
**RECORDS HEAD**
**TOTALIZES FLOW**
**Direct Float Operated or Remotely Controlled**

To find out more about the STEVENS Type B Recorder, and how it can simplify the task of compiling accurate flow records, write for FREE Bulletin 25.

**SEND FOR NEW STEVENS DATA BOOK**

**Puts interpretive data at your finger tips. 144 pages of technical data . . . information on float wells and recorder installations . . . a wealth of hydraulic tables and conversion tables.**

**$1.00**

*Foremost in Precision Hydraulic Instruments Since 1907*

**LEUPOLD & STEVENS INSTRUMENTS, INC.**

**4445 N. E. GLISAN STREET • PORTLAND 13, OREGON**

president, R. C. Becherer, and J. L. Carson, general manager of the Colmar Plant. Both were on hand to receive the press representatives and explain the plant and its functions.

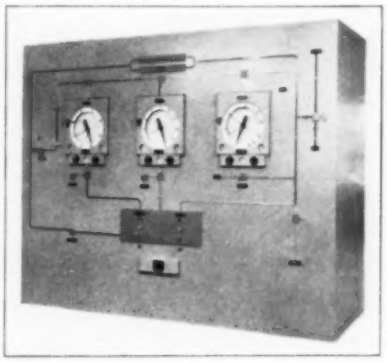
The plant is located at Colmar, Pa., some 25 miles north of Philadelphia, on the Reading Railroad, which has named the new station Link-Belt Station. Situated on a 43-acre tract, the plant has 300,000 sq. ft. of floor area. The manufacturing plant is 880 ft. long and 300 ft. wide. The office building, which accommodates the engineering, design and development force of more than 100 designers, engineers and draftsmen on the second floor, is 240 ft. long and 60 ft. wide and without columns. On the first floor are the sales and accounting offices, a modern 300-seat cafeteria and medical dispensary.

Of interest to readers of *Water and Sewage Works,* the Colmar Plant, as stressed by President Becherer, has developed its own water supply from three drilled wells, and a vest-pocket edition of a complete sewage disposal plant which employs two-stage "Bio-filtration" and every unit of Link-Belt equipment that it was possible to incorporate.

This flexible miniature plant designed to accommodate up to 1400 day-shift employees and sewage flow of 90 gals. per minute, is to be used as an experimental plant and will provide comparisons of the new "Uniflow" design of sloping bottom clarifier with the ordinary flat bottom unit. The plant has a completely equipped laboratory in which experimental work will be conducted on industrial waste treatment as well as sewage treatment.

This plant was designed by "Jo." Gilbert and associates in the Sanitary Engineering Division of Link-Belt. It provides primary settling, two-stage high-rate bio-filtration with return flow ratio of two-to-one, separate sludge digestion, sludge dewatering on sand beds and chlorination of the final effluent. Novel is the sludge aeration prior to transfer to the digester. Aeration of the sewage and recirculated effluent is also to be tried for improving the oxygen demand reduction through the primary clarifier while also serving as a means of odor prevention.

Ed. Note: With the aid of a magnifying glass, the Sewage Treatment Plant can be seen in the right background of the accompanying airplane view of the manufacturing plant.



## Automatic Water Treatment Control

102

Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Philadelphia, Pa., has developed a system of instrumentation whereby the treatment of recirculated cooling water is completely, automatically controlled by three Brown ElectroniK indicating and recording potentiometers with Air-O-Line controllers mounted on a graphic panelboard.

As shown in the above photograph, the ElectroniK potentiometer at the left continuously measures, records, and controls the pH of the circulating water. The middle potentiometer, actuated by a flow type colorimeter, continuously measures,

records, and controls the addition of sodium dichromate used as a corrosion inhibitor, and the potentiometer on the right controls the concentration of dissolved solids in the water by adjusting the pneumatically operated blow-down valve in accordance with the measured conductivity.

Signal lights on the panel indicate the water level in the two sections of the tower (lower center), the source of make-up water (three lights at the extreme right), and the operation of the pumps on the acid feed and the sodium dichromate feed, and the blow-down valve. Make-up water is automatically controlled by means of two Honeywell float-type, liquid level pneumatic controllers located at the tower.

## John Segraves Joins Minneapolis-Honeywell as Water and Sewage Engr.

Minneapolis-Honeywell Regulator Co. announces through John Procopi, Chief of Market Extension Div., that John W. Segraves has been employed as Water and Sewage Engineer in the Market Extension Div.

Mr. Segraves, a graduate of Lehigh Univ., comes to Minneapolis-Honeywell from the Sanitary Eng. Div. of the Penna. State Dept. of Health. He will serve the Market Extension Div. as specialist in water supply, sewage treatment and industrial waste matters to which the Brown Instruments Div. of the company is paying considerable attention in developing new, improved and special equipment for applications in these fields.

In World War II Mr. Segraves was a member of the "Sea Bees" as sanitary engineer. He is a member of the Am. Chemical Society, the Pa. Sewage & Ind. Wastes Assn. and the honorary engineering fraternity Tau Beta Pi.

## Roberts Filter Co. Quarter Century Club Initiates Five New Members

The fifth annual banquet of the Quarter Century Club of the Roberts Filter Manufacturing Company, Darby, Pa., was held November 12,

Impact Insurance Against

1—LOSS OF FIRE PROTECTION.

2—EXCAVATION AND PAVEMENT REPLACEMENT.

3—COSTLY REPAIRS INVOLVING MAJOR HYDRANT COMPONENTS.

4—FLOODING.

The Smith Protectop Hydrant is designed to permit rapid return to service at minimum cost when a Hydrant is damaged as a result of a traffic accident.

The Protectop Hydrant Standpipe and Valve Stem are equipped with Special Couplings located just above the ground. The Couplings withstand operating pressures and ordinary impact with an ample factor of safety. Under excessive impact occasioned by traffic accidents the Couplings fracture at the design points thus minimizing the damage and permitting speedy return to service at low cost.

All Smith Hydrants are equipped with Compression Type Valves which definitely eliminate flooding since the line pressure holds the Valve against its seat in the closed position.

Write for details.

38

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

BELL JOINT LEAK CLAMPS

GASKET SEALER COMPOUND

CHARCOAL CAST IRON BOLTS

Also Anchored Glands for mechanical joints to replace socket clamps.

Write for information

H. Y. CARSON COMPANY

1221 Pinson St. Birmingham, Ala.

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A Filter Medium For All Purposes

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All correspondence regarding sales and engineering should be addressed to:

PALMER FILTER EQUIPMENT CO.

822 E. 8th St. Erie, Pa.

Engineers and Sales Agents

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.


# OVER 50 YEARS EXPERIENCE
## —Yet as modern as tomorrow . . .

**BLACKBURN-SMITH PNEUMATIC SEWAGE EJECTORS**

**TO LIFT SEWAGE AND SLUDGE AT TREATMENT PLANTS**

30 to 500 GPM in both single and twin units against high discharge heads.

Duplex Sewage Ejector, showing inlet piping.

Over 50 years service has proved the rugged worth of Blackburn-Smith Ejectors. Yet our today's product is full of exclusive modern features such as:

1. Float and electrical float switch controls.
2. Float and pneumatically controlled snap action valve.
3. Electrode controls.

Any one of the above, with or without Air Receivers.

Preferred by most prominent consulting engineers as less messy, more sanitary than centrifugal submerged type sewage ejectors or pumps. Ends screen and pump cleaning. Sewage can be lifted straight up—150 feet—any capacity—once a minute, without fail. Catalog S 50

*REPRESENTATIVES WANTED. ADDRESS:*

**BLACKBURN-SMITH MFG. CO. 92 River St. HOBOKEN, N. J.**



**The practical, economical answer to your underdrain problems**

# LEOPOLD
*Glazed Tile*
**FILTER BOTTOMS**

No corrosion or tuberculation • Practically non-absorbent • Equal filtration, distribution • Low loss of head • Long life • Proved superiority.

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2413 W. Carson Street
Pittsburgh 4, Pa.



# LEADITE
The Pioneer Self-Caulking Material for C.I. Pipe

**MORE THAN 50 YEARS PROVE IT!**

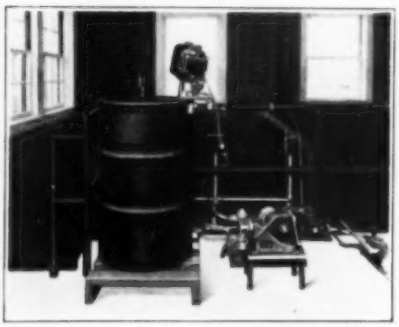
• Tested and used by engineers, water works men and contractors for more than 50 years. LEADITE has proved its dependability under most every condition of water main construction . . . proved that it makes a good tight lasting joint that improves with age.

**THE LEADITE COMPANY**
Girard Trust Co. Bldg., Philadelphia, Pa.

*No Caulking*


1952, for employees who have served the Company for 25 or more years. Five new members were admitted to the Club, making a total of 25 service and 3 honorary members.

Charles F. Leinhauser was elected President and Carlisle H. Reville Secretary for the coming year.



## "Packaged" Fluoridation System

103

Proportioneers, Inc., Providence, R.I., has developed a "packaged" system that handles the complete fluoridation job for a town of 12,000 people.

The system feeds a constant strength slurry of sodium silicofluoride into the pumped water supply and provides economical, safe fluoridation with minimum attention and maintenance on the part of the plant personnel.

The slurry is fed by Proportioneers Midget Heavy Duty Chlor-O-Feeder. The concentrated slurry is fed into a bypass where it is diluted, mixed, and transmitted to the main line which feeds the elevated storage tank. Because this is a positive displacement pump, over-fluoridation is a physical impossibility.

The system involves simple electrical hook-ups—a cross-connection between chemical feeder and main water pump plus a time delay circuit which starts the recirculating pump and also the agitator in the slurry tank three minutes ahead of the feeder motor.

## Kent Clow Passes

**Leading Chicago Industrialist Took Important Part in Political and Civic Activities**

Kent S. Clow, president of James B. Clow & Sons of Chicago, and of its subsidiary companies, the Eddy Valve Co. of Waterford, N.Y., and the Iowa Valve Co. of Oskaloosa, Ia., passed away at his home in Lake Forest, Ill., on December 14th. He was 64 years old.

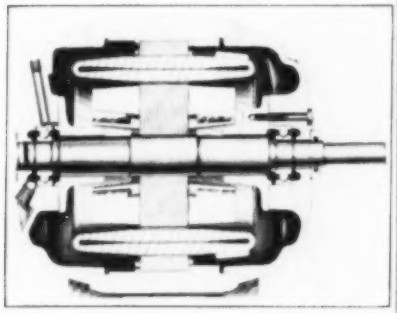
Mr. Clow, a native of Chicago, was a graduate of Yale University

in 1910. For 30 years he had been a resident of Lake Forest, Ill., and took an important part in the Republican Party which he served as president of the Republican Citizens Finance Committee of Illinois until ill health was responsible for his resignation during the year. As a fund raising organization, this committee had in its coffers $250,000 at the time of Mr. Clow's retirement as its active head.

In 1933 and 1934 Mr. Clow was president of the United Charities of Chicago and was a former president of the Chicago Club and a director of the Lake Forest Hospital Assn. He was a member of numerous clubs and a director of the First National Bank of Lake Forest.

As an industrialist, Mr. Clow followed in the footsteps of his illustrious forebears who established the James B. Clow & Sons firm which occupies a position of great importance in the plumbing supply field and water and sewage works field.

Mr. Clow is survived by his widow, two daughters, six grandchildren and two sons, Kent S., Jr., and William E., II.



## Totally-Enclosed Motor

104

U. S. Electrical Motors, Inc., Los Angeles, Calif., has just developed a new totally-enclosed motor designated as Type SS. It is designed for services where dampness, dust, fire hazards and corrosive fumes are prevalent. Because of its construction, Type SS is self-cooling. This eliminates the use of an exterior fan and any unsightly, heat-dissipating fins. The smooth exterior greatly lends itself to wiping off or hosing down — an important feature for motors to be used in dusty and dirty locations. Type SS is also provided with a slinger to protect the output shaft bearing against the entrance of dirt or water.

This motor, also available in Type SES, has been approved for explosion-proof service in hazardous locations by the Underwriters' Laboratories, Inc., and bears the official label.

These new motors are immediately available in a range from ½ to 2 h.p. (also fan-cooled to 75 h.p.) and will later be produced in larger ratings.

## Smith of Byron Jackson Elected Director

Byron Jackson Co., Los Angeles, Calif., at a recent meeting, increased the number of Directors from eight to nine and Mr. Malcolm Smith was added to the Board.

Mr. Smith has been a resident of Los Angeles since 1948, maintaining in the past several years an office in the General Petroleum Building.

Mr. Smith is a native of Massachusetts, a graduate of Brown University and Harvard Business School. He started in the investment banking business with Bond and Goodwin, Inc., in New York City in 1928 and was later a partner in Glore, Forgan & Co. During the Second World War, he was a Lieutenant Colonel of the U. S. Army located in Washington, D. C. After the war, Mr. Smith was a partner of J. H. Whitney & Co. of New York until he came to Los Angeles in 1948. Mr. Smith is a

**Why we keep it DRY...**

Dry chlorine is inert — you can ship it in ordinary steel cylinders and pipe it through iron pipe or even copper tubing. But add even the slightest trace of moisture to it and chlorine gas becomes highly corrosive.

***That's why*** we designed BUILDERS Visible Flow CHLORINIZER to meter and control the flow of chlorine gas in its dry, non-corrosive state. Precision parts which assure the safe, dependable operation of these chlorine gas feeders stay "like new" even after years of service. Actual experience with hundreds and hundreds of installations throughout the country has proved the soundness of Chlorinizer's basic engineering . . . Yes, the right way to handle chlorine gas is the dry way.

For detailed information about Builders Chlorinizers, address Builders-Providence, Inc. (Division of B-I-F Industries), 350 Harris Avenue, Providence 1, Rhode Island.

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...with a GREENLEE PIPE PUSHER

Installing pipe underground is quick and simple this way. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe through the ground—under streets, railways, walks, lawns, floors. Saves time, cuts costs through elimination of extensive ditching as just a short trench accommodates the Pusher. No tearing up of pavement, lawns, floors . . . eliminates tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. Pusher often pays for itself through timesavings on first job or two.

**No. 790 GREENLEE PUSHER** For 3- 4 to 4-inch pipe. Six speeds – 5,600 to 40,000 lbs. pushing pressure.

**No. 795 GREENLEE PUSHER** For pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. Six speeds – 25,000 to 150,000 lbs. pushing pressure.

**POWER PUMP** For both sizes of GREENLEE Pushers. Pushes pipe at rate of two feet per minute.

GREENLEE

Get facts on timesaving Greenlee tools now. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 2241 Columbia Avenue, Rockford, Illinois, U. S. A.


director of the Spencer Chemical Co. and The Vendo Company, both of Kansas City.

## John R. Barnes Dies

John R. Barnes, representative of the Neptune Meter Company in the State of Iowa, died on November 13, 1952, at the age of 57. He had been in failing health for some time.

Mr. Barnes, who made his home in Oskaloosa, Iowa, had been employed by Neptune since January, 1924, and was one of the original staff of the company's Kansas City office. He was a member of Neptune Meter's Twenty-Five Year Club and of the American Water Works Association. At the meeting of the Iowa Section of the A.W.W.A. in Mason City this year, he was nominated to receive the Fuller Award.

He is survived by his brother, Floyd E. Barnes, and sister, Faye Barnes Rickey.

## Sludge Gas Metered With Low Permanent Head Loss

105

The Foxboro Company, Foxboro, Mass., has developed the Type 29 Flow Meter, for the measurement of sludge digester gas with permanent head loss as low as one-half inch of water.

Construction details of the Foxboro Type 29 Flow Meter keep head loss to a minimum. High and low pressure connections from the primary device in the gas flow line are made above and beneath a stainless steel bell in the meter chamber. The pressure differential across the bell causes an attached calibrated spring to deflect, restoring equilibrium conditions in the bell and moving the pen or pointer to measure the gas flow.

The meter is available in ranges of 1", 2½", 5" and 10" of water;

FOR SUPPLY-WATER OR TRADE-WASTE TREATMENT

Hardinge THICKENERS or CLARIFIERS have solved problems for the following industries with water treatment, waste-disposal or by-product recovery difficulties: coal, paper, oil, glass, lime, stone, sand, carbon black, meat packing, rubber, domestic sewage, and others.

Available for steel, tile, wooden or concrete tanks up to 200' diameter with the famous "Auto-Raise" feature to prevent scraper breakage. Write for Bulletin 31-D-15.

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can be equipped to operate in hazardous atmospheres; has a weatherproof case for outside installations. All critical parts are corrosion-resistant stainless steel. It can be furnished as a recorder, indicator or totalizer and equipped as a pneumatic transmitter for remote transmission of sludge gas measurement.

## L. E. Demler Heads New Wallace & Tiernan Feeder Department

Wallace & Tiernan Co. Inc. Newark, N.J. has announced the promotion of Lester E. Demler to Manager of a newly established Chemical Feeder Department.

Demler, formerly a Sales Engineer for Wallace & Tiernan Products, Inc. specializing in the sale of precision instruments, will be in charge of the sales of W&T's complete line of chemical feeders for the sanitary engineering field and the food and chemical processing industries as well as automatic weighing scales for feed and flour mills.

Demler joined Wallace & Tiernan in 1935 shortly after his graduation from Case Institute of Technology. During his seventeen years with the company, he has worked in the field sales organization, the main office sales engineering department, and for the last eight years in the precision instrument sales department.

## Builders Introduces New Flo-Watch Model

106

Builders-Providence, Inc., Providence, Rhode Island, has introduced a new Flo-Watch Model (AFUAQ) for metering flow of liquids, steam, air and gas. Flo-Watch measures the flow through standard differential producers such as Venturi Tubes, nozzles, and orifices, also, it is designed for use with Kennison Open Nozzles, Flumes, and Weirs. This instrument is adaptable for any combination of totalizing, indicating or recording functions.

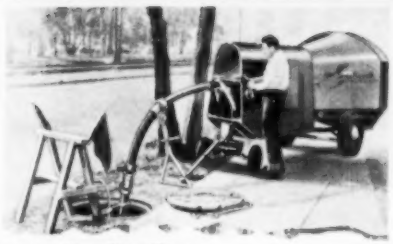
A totalizing model with transmitter attachment can actuate a secondary instrument or pace a chemical feeder remotely located. The functions of the secondary unit will be in direct proportion to flow. A Summation Meter also may be operated from simple transmitting attachments in several individual Flo-Watch instruments to summate the flow readings of a number of meters. Only electrical connections are required from the Flo-Watch Transmitter, thus allowing the Summation Unit to be located wherever convenient.

The totalizer reads directly in quantity units such as gallons or cubic feet, and the indicator scale and chart graduations are carefully arranged to provide maximum readability throughout the measuring range from 25% to 100% of full scale.

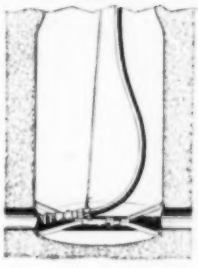
## Hammond Iron Works Acquires Keyes Tank

Hammond Iron Works, Warren, Pa., has announced the acquisition of Keyes Tank Co. of Provo, Utah, and Keyes Tank & Supply Co. of Casper, Wyoming, which for the past several years have been licensed to fabricate and sell Hammond designs of con-


**"FLEXIBLE" Exclusives THAT Revolutionized SEWER CLEANING**



Since 1932 FLEXIBLE has led in pioneering improved sewer cleaning methods and equipment. Here are today's most important "FLEXIBLE" musts!

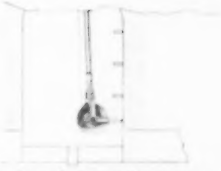


The **SeweRodeR**

A mechanical marvel that does all rodding with one man and a helper. Pushes, turns, pulls . . . pulls back loads and "rods in" for more.

**FLEXICROME ROD COUPLING**

An improved coupling recommended for HIGH-SPEED POWER TURNING . . . developed through years of experience. Never connects in the wrong hole. Faster to assemble.



***Surface-Hung* MANHOLE ROLLER**

Works loose brick manholes (any size) far faster. Fits any two leg bucket machine. Installs from above ground.

**"FLEXIBLE"**

WRITE today

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Francis Hankin — Montreal & Toronto, Canada

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS AND EQUIPMENT

servation storage tanks in the Rocky Mountain area.

Present Keyes management and personnel will be retained and operations will be conducted as the Keyes Tank Division of Hammond Iron Works. Lester Johnson, with headquarters at Casper, is manager of the Keyes Tank Division and the Provo plant is under the supervision of Donald Newell.

In addition to the general line of Hammond floating roof tanks and the field erected conservation types, Keyes will continue to fabricate a general line of steel plate construction including underground tanks, steel reservoirs, mud tanks for rotary drilling, production field tanks and standard API and AWWA designs of any capacity.

## Stauffer Pipe Repair Clamps Available With Stainless Steel Coating

107

Adams Pipe Repair Products, El Monte, California, announce that the malleable iron castings in their line of Stauffer Pipe Repair Clamps are now furnished with two coats of powdered stainless steel in plastic suspension. This feature provides much greater protection against corrosion. These clamps also have stainless steel bands which assure longer life. Stauffer Pipe Repair Clamps are said to provide a positive, permanent repair for leaks, blowouts, and short splits in all types of pipe . . . standard steel, OD, cast iron, asbestos-cement, etc.

One of the outstanding features claimed for Stauffer Clamps is the exclusive slotted lug which enables the user to simply drop bolt through slot and tighten. There are no nuts to start and no fishing of bolts through holes. This feature is said to make installation under water especially easy.

Stauffer Pipe Repair Clamps are available for pipe sizes from ½″ to 24″ in standard widths of 3″, 6″, 9″ and 12″. Widths up to 36″ are available on special order.

Made-up Mechanical Joint cut away to show its design.

Standard compression type fire hydrant made in full compliance with latest AWWA Specifications. Available in Standard model or Traffic model. Main valve opens against the pressure. Valve will remain closed in case hydrant is broken off in traffic accident. Features include low friction loss, high efficiency, revolving head, dry top, easy lubrication.

Hydrant shoe has two heavy lugs for use in strapping hydrant to pipe line. The end connection is Standardized Mechanical Joint in accordance with specifications of Cast Iron Pipe Research Association. A thick gasket is compressed by a bolted follower ring. Advantages include easy assembly, low joint cost; deflection, expansion and contraction without leakage. For complete information, write or wire M & H VALVE AND FITTINGS COMPANY, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

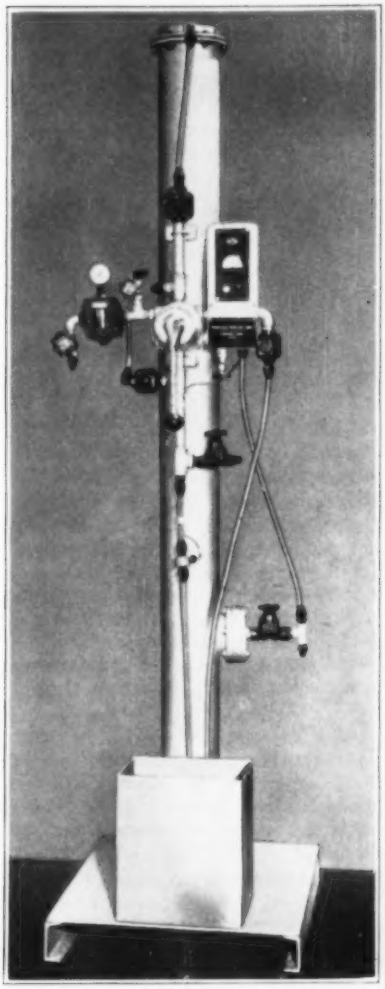
## F. Osborne Joins Smith-Blair Staff

Smith-Blair, Inc., South San Francisco, Calif., has announced the appointment of F. F. Osborne as General Sales Manager.

Mr. Osborne brings to the organization more than 19 years experience in the waterworks engineering field.

He received his Bachelor of Science degree from Pomona College and a mechanical Engineering degree from the University of Southern California. His background includes 9 years as sales engineer for two of the nation's largest pump manufacturers, Fairbanks-Morse and Byron Jackson Companies. He served 6 years as a civilian employee of the U.S. Engineers, designing and supervising the installation of water systems in the Aleutian Islands. He has been an independent consulting engineer for several years.

Mr. Osborne's headquarters will be at Smith-Blair's main office and factory at South San Francisco. He will supervise the branch warehouse and sales organization of Smith-Blair at Downey, California, and the distributors and jobbers throughout the United States and Canada.



## Compact, 100 GPH Mono-Column Demineralizer

108

The Penfield Manufacturing Company, Meriden, Connecticut, has announced the addition to its line of demineralizing equipment a new Mono-Column Demineralizer with a capacity of 4500 grains designed for users of up to 100 GPH of superhigh purity water.

The new Penfield M-100 Demineralizer is exceptionally compact, requiring for its installation only 2′ x 2′ x 7′6″ of floor space, connection of influent to a plant's water system, and connection of effluent to those points where high purity water is required.

Raw water enters the demineralizing unit at the influent and after passing only once through the mono-column of mixed cation and anion resins, is received at the effluent stripped of all its impurities. A flow meter on the influent enables the user to control the water intake, for the most efficient ion exchange action, and an electric purity meter provides continuous indication of the purity of the demineralized water being received at the effluent.

## Permutit Plans Expansion

The Permutit Company, New York, N.Y., has announced that coincident with the completion of their 1952 program for doubling the capacity of the Birmingham, New Jersey, works for the production of ion exchange resins, the company has now placed contracts for further extensions and improvements, including a new laboratory and pilot plant building to cost approximately $200,000 in all.

These new additions are provided to meet increased demands for ion exchange resins and are a part of the company's long-range plan to meet anticipated growth in the use of ion exchange processes in industry and power plants.

## Builders—Omega Open Buffalo Office

Builders-Providence, Inc., and Omega Machine Company, Providence, R.I., has announced the opening of a Sales Office in Buffalo, New York.

The new office will be located at

install with Pride operate with Profit

a modern laboratory equipped by KEWAUNEE

New Laboratories of Froedtert Grain and Malting Co., Milwaukee, Wis. are Kewaunee equipped.

You will always be proud to show your Kewaunee Laboratory Equipment to plant visitors. Kewaunee pieces reflect, in every detail of modern design and painstaking workmanship, the pride of craftsmen who have produced finer Laboratory Equipment for more than 40 years.

When you choose Kewaunee, you will be proud to say to your guests, "Step in" and there before their eyes you will register strong proof that in the making of your product

Quality IS WATCHED AT EVERY STEP

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If you want to put new cheer in your laboratory crew—and new creative laboratory achievements in your company's record book, equip with Kewaunee.

**Catalogs sent free on request. State whether interested in wood or metal.**

Remember, too, that Kewaunee's experienced Laboratory Engineers are available for consultation without charge to give you a laboratory—more modern—more functional—more convenient—and more lasting in service. Write—

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*Representatives in Principal Cities*

3053 Main St., Buffalo 14, New York. This office will be known as B-I-F Industries Buffalo.

## Photomultiplier Attachment for Spectrophotometers

109

Beckman Instruments, Inc., South Pasadena, Calif., has developed a new Photomultiplier Attachment that greatly increases the sensitivity of Beckman Model DU Spectrophotometers—particularly in the 200 to 600 millimicron range.

With this new attachment it is now possible to obtain an overall amplification gain from 100 to 1000 times that of the standard ultraviolet sensitive phototube. Resolution of the instrument is greatly increased in all spectrophotometric measurements, but particularly in turbidimetric, flame, and fluorescence determinations.

## Beckman Names Bishop Assistant General Manager

Beckman Instruments, Inc., Instrument Division, South Pasadena, Calif., has announced the appointment of John F. Bishop as Assistant General Manager.

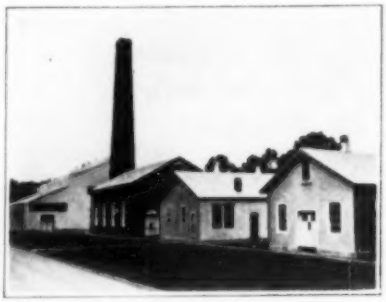
Formerly head of Special Products Division, Bishop founded this department for Beckman one and a half years ago. He has contributed many new production and product developments in that capacity, including new computer designs and advanced analytical instruments. Bishop is a specialist in sales engineering and management. He accepted his Bachelor of Science Degree at the University of California at Berkeley in 1945 and an M.B.A. Harvard, 1948.

## Felt Tape with Permanent Bond

110

Spring Packing Corporation, Chicago, Illinois, has developed a pressure-sensitive tape (felt tape with adhesive on one side), with a duo-purpose adhesive that provides for permanent attachment, when desired. As it comes from the roll, this new Spring-Felt adheres tenaciously under light finger-pressure to all surfaces—metal, glass, wood, ceramics. And, for permanent bond, the adhesive merely is moistened with a liquid reactivating agent.

This new optional method of application adds still further to Spring-Felt versatility for many different uses. It seals against dust, air, fumes, moisture; eliminates squeaks and rattles; cushions glass, and desk and bench equipment; damps vibration; impedes electrolysis; resists flame, oil, fungus, mildew. And it cuts cleanly and easily into shapes and gaskets.



## Marlow Pumps Expands Into Southwest

Marlow Pumps, Ridgewood, New Jersey, has put into operation a complete branch factory of 16,000 square feet in De Queen, Arkansas.

The new plant, ideally situated in southwestern Arkansas, permits fast delivery to all sections of the fast-growing southwestern United States. In addition to manufacturing and assembling pumps in De Queen, the new factory will also carry a complete inventory of all Marlow pumps as well as replacement parts. Sales and engineering staffs have been en-

FOR WATER SOFTENING . . . TURBIDITY AND COLOR REMOVAL
. . . INDUSTRIAL WASTE TREATMENT . . .

*The Clariflow*

**with independently-operated mixing, flocculation, stilling and sedimentation zones**

The CLARIFLOW gives control over each individual function of controlled reaction stage flocculation, vertical clarification and positive slurry thickening and removal.

Initial mixing and reaction done in an isolated mixing tank insuring complete reactions.

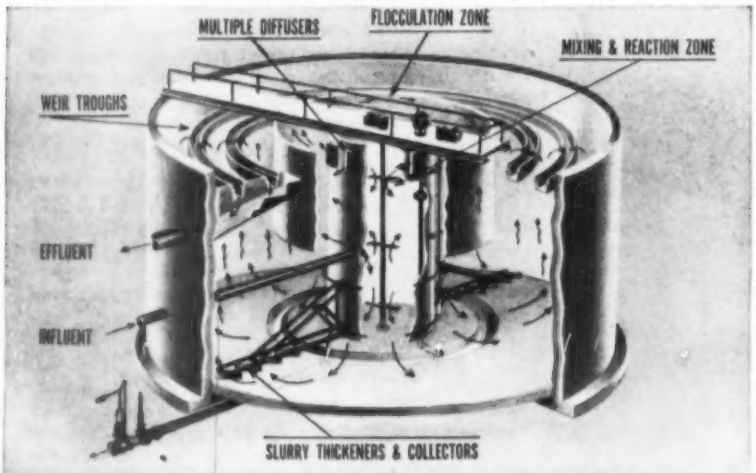
Exclusive multiple, tangential diffusers simultaneously and equally distribute flow to avoid "tendencies" and initiate slow flocculation.

Recirculation of precipitate for catalyzing purposes is positive and controllable. Erratic "Blanket Filtration" is not practiced.

Thickeners used to scrape settled slurry to the blow-off point.

Exclusive *Balanced* multiple surface weir troughs make efficient use of short detention periods and insure clarified overflows.

*Write for Bulletin 656*

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AURORA, ILLINOIS
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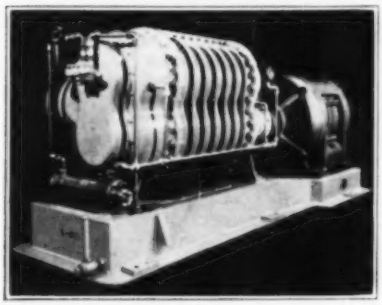
larged and will use the new plant as a regional headquarters.



## Roots-Connersville "Spiraxial Compressor"

111

Roots-Connersville Blower, Connersville, Indiana, has developed a gas or air compressor called the "Spiraxial Compressor," that is, within its range, entirely new in principle and design.

Instead of conventional rotors, the Spiraxial Compressor employs two intermeshing screw-rotors which rotate in opposite directions. These screws are operated by gears synchronized to prevent contact, allowing close but definite clearances between them. The "Spirotors" are formed along a spiral surface accurately generated to maintain correct clearances.

According to the company, the flow of air or gas is axial, with most of the compression taking place at the back of the casing, thereby allowing an extremely large inlet opening, thus preventing strangulation of the inlet air and increasing the volumetric efficiency.

The Spiraxial Compressor is designed to increase the flexibility of the R-C Dual-ability line by bridging the gap between the conventional Rotary Positive and Centrifugal Compressors.

## Beckman Appoints Fletcher Special Products Manager

Beckman Instruments, Inc., South Pasadena, Calif., has announced the appointment of Taylor Fletcher as Manager, Special Products Division. Fletcher replaces the former manager, John F. Bishop, who was recently made Assistant General Manager of the company.

As design engineer, Fletcher contributed to the development of the Beckman Aquameter, Electronic Analog Simulating Equipment and the Phase Equilibrium Computer. In his new position Fletcher will continue to emphasize expansion toward new products, production prototypes and exploratory research in all phases of automatic control instruments.

Fletcher accepted his Bachelor of Science degree in electrical engineering at California Institute of Technology, Pasadena, 1948. He completed graduate work in advanced Meteorology, New York University. He laid the foundation for his present creative engineering work when assigned as design engineer for General Electric, Schenectady, New York and electronic technician with Jet Propulsion Labs, Pasadena, Calif.

## Explosive-Gas Alarm for Fixed Location

112

Johnson-Williams, Ltd., Palo Alto, California, has designed a Model E

CLIMAX
POWER FROM
COST-FREE SEWAGE GAS
climax BLUE STREAK ENGINE
OPERATES CONTINUOUSLY ON
SEWAGE GAS AT AMES, IOWA
Illustrated is a Climax 50 H.P. sewage gas engine direct connected to a 35 KW generator which operates in parallel with the municipal power service. The amount of power developed varies with the gas supply but the generator produces over 70% of the plant's average power requirements. Jacket water and exhaust heat is utilized in heating the digester.
This plant serves the City of Ames and Iowa State College, a population of 24,000. Its laboratory is used by the college students for research.
Ames, like many other cities, installed a Climax Engine to do the job because of the minimum operating expense, unmatched dependability, and conservative rating at slow speed.
climax
ENGINE AND PUMP MFG. CO.
Factory and General Office: Clinton, Iowa
Regional Offices: Chicago, Ill., Dallas, Texas

Combustible Gas Alarm that offers protection at low cost. By maintaining a continuous watch for the appearance of potentially explosive gases, the Model E minimizes the danger of hazardous operations. The instrument consists of two units: the weather-resistant detector and the control box which is mounted at a remote location.

Operating by diffusion and convection, the flashback-proof detector senses the presence of combustible gas. At 0.2 of the lower explosive level a red indicator light is energized on the control box panel. As the hazard is removed, the red light extinguishes. Operating from standard 115-volt lines, the instrument features an all-electronic alarm circuit which is free from meters, meter-type relays, and other delicate mechanisms.

Terminals are provided in the control box for the actuation of auxiliary audible alarms, for the control of motors or valves, or for the connection of repeater signals for distant points.

## New Appointments by American Well Works

The American Well Works, Aurora, Illinois, has announced the appointment of the following sales representatives:

Minneapolis Branch, A. Y. McDonald Manufacturing Co., 822 South Third Street, Minneapolis 15, Minnesota—for the State of Minnesota.

F. S. Crook Co., 455 Paul Brown Bldg., St. Louis 1, Missouri—for Eastern Missouri and Southern Illinois.

## Vincent R. Cioffi Appointed Sales Manager of Belco

Belco Industrial Equipment Division, Inc., Paterson, New Jersey, has announced the appointing of Vincent Cioffi as Sales Manager. He is a graduate engineer of St. John's University and of the University of Missouri holding a degree of BS in chemistry.

Mr. Cioffi completed organization of Belco's Canadian division during the past year. He pioneered in the development of the Belco Clarator, prior to which he was employed in Belco's technical sales division.

Mr. Cioffi was formerly employed in the service department of Infilco, Inc.

## Rust Inhibitor Now Added to Ice Rem

113

Speco, Inc., Cleveland, Ohio, announced the addition of a new phosphate type rust inhibitor to Ice Rem ice and snow melting chemical pellets.

Known as Speconite, the new inhibitor is said to safeguard against excessive rust in the deicing of the metal pipes, drains, downspouts, etc. Ice Rem is reputed to have 30 times the thawing capacity of salt and remains to melt subsequent snows until its action is completely exhausted. It is also stated to be harmless to vegetation, rubber, asphalt or paved surfaces.

## Conoflow Appoints Wisconsin Representative

Conoflow Corporation, Philadelphia, Pa., has announced the appointment of George Chipley as representative in the state of Wisconsin.

(*Continued on page 99A*)

THE SILENT WATCHMAN

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**NOTE—**

**These cards are to be used only for items described in THIS ISSUE**

**WATER & SEWAGE WORKS**

**Will see that you receive information desired.**

(Continued from page 98A)

Located in Milwaukee since 1946, George Chipley has been associated as sales engineer with a large power and electric equipment concern, and, more recently, as sales engineer with a manufacturers' representative specializing in equipment for power and process. A registered professional engineer and graduate of U.S. Naval Academy, Mr. Chipley also served in the Engineering Departments of the U.S.S. Chicago and U.S.S. Indiana during the war years.

Headquartered in Milwaukee, Mr. Chipley will supply the eastern portion of Wisconsin with Cono Controls.

## M. H. Smith Joins Atlas Mineral

Atlas Mineral Products Company, Mertztown, Pa., has announced that Martin H. Smith, formerly of Hercules Powder Company, has joined the Technical Service Department of the company.

## Literature & Catalogs

### Verticlosed Motors Featured in New Bulletin

114

U. S. Electrical Motors Inc., has just published a 16-page bulletin on **U. S. Verticlosed Motors.**

The bulletin dramatically illustrates the motor with accompanying drawings of individual features in full color. Engineering data includes discussions of tandem bearings, dual balancing of rotors and the complete motor assembly, use of automatic backstops for preventing the motor from spinning backward, comparisons of solid shaft and hollow-shaft designs, description of two types of lubrication and progressive views of pump motors showing their continuous improvement during the past 40 years.

### Evenly Graduated Flow Meters

115

Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Philadelphia, Pa., has just published a catalog on **Evenly Graduated Flow Meters.**

The bulletin presents the new line of Honeywell evenly graduated flow meters for measurement, recording, indication, and integration of fluid flows. The characterized bell for

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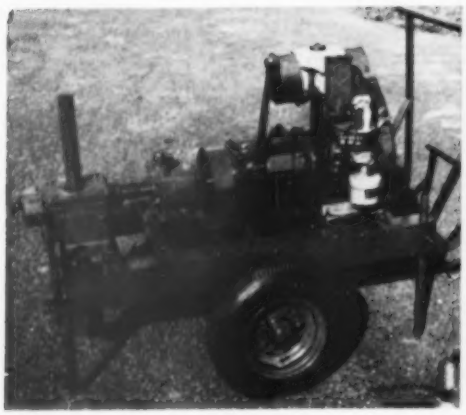

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PAYNE DEAN & CO.
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square root extraction and the electronic integrating mechanism are covered in detail.

Models described include the electric meter utilizing an induction bridge system for remote measurements, the ElectroniK flow recorder-indicator featuring an electronically powered circuit, and the area type meter for the measurement of viscous flows.

Complete specifications, operating information, accessory equipment data and reference to other types of flow meters are included.

## Rust Preventive

116

Rust-Oleum Corporation, Evanston, Illinois, has just released a new bulletin on how **Rust-Oleum Stops Rust.**

The bulletin discusses what Rust-Oleum is and how it eliminates costly sandblasting operations when preparing rusted surfaces. Complete directions for use and application are included for the primers, short oil and long oil types of coatings. All types of color swatches are also included in the bulletin. Two pages of typical questions and answers pertaining to the use and application of Rust-Oleum are given in the back of the bulletin.

## Spreader Jets for Rotary Distributors

117

Pacific Flush Tank Company, Chicago, Ill., has just published a 4-page 2-color bulletin on **P.F.T. Spreader Jets for Rotary Distributors.**

P.F.T. spreader jets with removable deflectors as well as the patented P.F.T. spreader jet with hinged deflector, are detailed and pictured in the bulletin.

## Industrial Waste Treatment Guide

118

Builders-Providence, Inc., Providence, R.I., has just published a new **Industrial Waste Treatment Guide.**

This 8-page bulletin contains a highly useful table showing the different types or combinations of unit treatment processes for more than 50 wastes. A second table shows the equipment used in the several unit treatment processes. A third table shows Builders-Providence equipment available for use in these waste treatment processes.

The bulletin contains a two-page spread flow diagram showing how the various treatment processes and equipment may be combined to treat mixed wastes. Installation photos of equipment are also included.

## Proper Installation of Drain Tile

119

Bowerston Shale Company, Bowerston, Ohio, has just published a new illustrated bulletin, outlining specifications for the **Proper Installation of Drain Tile.**

This bulletin covers ASTM C4, ASTM C211 and Federal SS-T-310 standards. In addition, it includes information and diagrams on the most efficient depth, spacing and location of drain tile for the most efficient drainage.

## Protective Coatings

120

Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., has just published a bulletin on **Pitt Chem 100 Series Tar Base Coatings.**

The bulletin discusses the complete 100 series line of protective coatings and gives recommendations for special applications. Page 6 is devoted to Pitt Chem 104 that was especially developed for water tanks and mains. An application guide gives the grades and types of coating recommended for over 50 different conditions including water, sewage and industrial waste equipment.

## Neoprene-Lined Diaphragm Valves

121

Crane Co., Chicago, Illinois, has available a bulletin entitled **Check List for Crane Neoprene-Lined Diaphragm Valves.**

The 4-page, 2-color bulletin describes how the design of this valve eliminates the stuffing box, and the diaphragm keeps a tight stem seal. Page 3 contains a check list of all chemicals and materials handled by the valve and page 4 shows the recommended uses of the valves.

## Centrifugal Pump Selection Guide

122

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has just released a **Handy Guide to Selection of Centrifugal Pumps.**

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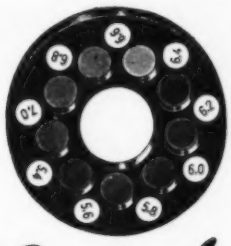

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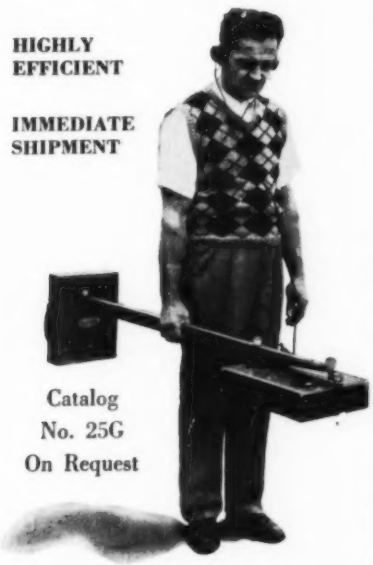

Catalog No. 25G On Request

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New Hyde Park New York

special purpose, marine and mixed and axial flow pumps, the bulletin has a head-capacity table for single stage, double suction Allis-Chalmers pumps.

Special purpose pumps mentioned include solids handling, paper stock, sewage, rubber-lined, process, fractional horsepower and coolant and circulating units.

## Fluoridators

123

Wallace & Tiernan, Newark, N.J., has just published a folder on **W & T Proven Fluoridators.**

The 2-color folder presents the complete line of fluoridators. Photographs show, Solution Feed Fluoridators, Volumetric Fluoridators, Loss-of-Weight Fluoridators and the Merchen Scale Fluoridator. Appropriate descriptions accompany each photograph.

## Wrought Iron Pipe Identification Booklet

124

A. M. Byers Company, Pittsburgh, Pa., has just issued a booklet describing five tests for the positive identification of wrought iron pipe.

This 2-color, 4-page identification booklet also tells why recognition of piping material is important and explains how to protect against the use of substitutes.

## Westinghouse Units in Sewage Plants

125

Westinghouse Electric Corporation, New York, N.Y., has available a short 4-page folder on **How Westinghouse Serves Hunts Point Sewage Disposal Plant.**

The folder shows by means of numbered photographs and circuit lines the Westinghouse Duplex System as installed in the Hunts Point Plant. The central control benchboard that provides finger-tip control of virtually all plant operations is featured on the cover.

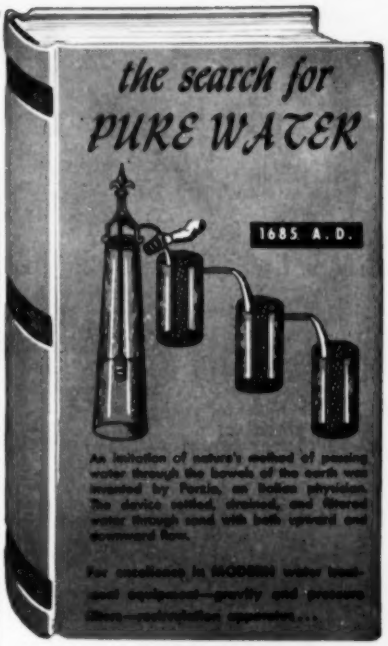
## Submerged Combustion

126

Submerged Combustion Company of America, Inc., Hammond, Indiana, has available a bulletin on **Submerged Combustion,** the economical way to heat corrosive or other liquids.

The bulletin discusses why submerged combustion saves fuel and corrosion losses; how submerged combustion operates; and where

(*Continued on page* 103A)

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"Nobody likes to kill," says Stanley Adams. "Nobody likes war. But today the surest way to invite a war is to be weak. You and I know that twice in the last ten years Americans have let their guard down. And the Philippine and Korean graveyards are filled with men who paid the price for it.

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Remember that when you're buying bonds for national defense, you're also building a personal reserve of cash savings. Remember, too, that if you don't save *regularly*, you generally don't save at all. So sign up today in the Payroll Savings Plan where you work, or the Bond-A-Month Plan where you bank. For your country's security, and your own, buy U. S. Defense Bonds now!

## Peace is for the strong... Buy U. S. Defense Bonds now!

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(*Continued from page* 101A)

submerged combustion can be profitably applied. The center pages explain by means of numbered photographs and drawings all the component parts of a submerged combustion installation. Also discussed is how submerged combustion can be used for recarbonation of water.

## Temperature Recorder Data

127

The Foxboro Company, Foxboro, Mass., has just issued a bulletin on **Temperature Recorder Data.**

The bulletin contains complete details of temperature recorder construction, showing how each component part, from bulb to chart, contributes to recorder accuracy. Its 20 pages provide factual information, assisting in the understanding, selection and use of temperature measuring instruments.

An entire section is devoted to selecting the correct thermal systems for temperature measurement applications. Characteristics of vapor pressure, gas pressure and liquid expansion system are explained in three pages of text and unique reference charts.

Illustrations include more than 50 photographs, charts and diagrams. Actual installations are pictured, design features checked, thermal systems charted, and complete descriptions provided for rectangular and circular case instruments, temperature bulbs, charts and accessories.

## Technical Supplement On American Rotary Distributors

128

American Well Works, Aurora, Illinois, has just published a new Technical Supplement "RD" covering **"American" Rotary Distributors.**

Technical Supplement "RD" gives comprehensive design data and information on Reaction Driven and Positive Motor Driven Rotary Distributors and Dosing Siphons, for rapid or standard rate sewage filters, sand filters, or for water aeration.

Design, construction, operating and performance features are fully explained, including the exclusive, patented "American" Positive Motor Driven Rotary Distributors, and the "American" spring loaded oil seal that eliminates costly mercury and maintenance of the conventional mercury seal. The oil seal withstands pressures above those normally developed due to head or surge in treatment plant systems, and greatly in excess of pressures which can be withstood by a mercury seal. Operation is trouble-free.

Contents include an informative discussion of Rotary Distributor Hydraulics; Table of Approximate Maximum Capacities of various size Distributors; Table of Maximum Flow (gpm) through Distributor with arm entrance velocity at 4 ft./sec.; Cross-Section Drawing of reaction-type, positive drive gear-type and clutch-type center columns; Illustrations of Dosing Siphon operation; useful general data on Loss of Head in fittings, valves, etc.; a Nomograph for flow of water in pipes; and a Diagram of Concrete Hollow Pier details.

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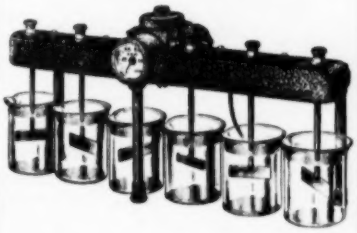

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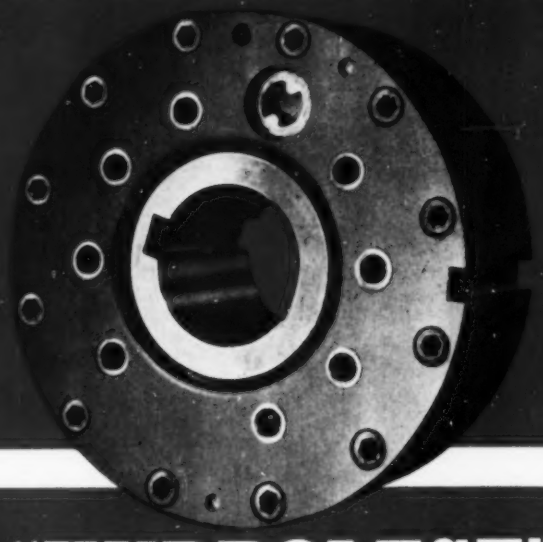

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